DOCUMENT RESUME

ED 090 815 HE 005 389

AUTHOR	Sandin, Robert T., Ed.
TITLE	The University as a System. Educational Comment/1974.
INSTITUTION	Toledo Univ., Ohio. Coll. of Education.
PUB DATE	74
NOTE	72p.
AVAILABLE FROM	Editor, Educational Comment, College of Education, The University of Toledo, 2801 W. Bancroft Street, Toledo, Ohio 43606 ($1.00)
EDRS PRICE	MF-$0.75 HC-$3.15 PLUS POSTAGE
DESCRIPTORS	Budgeting; Educational Change; Educational Finance; *Educational Planning; *Higher Education; Management Information Systems; *Systems Approach; *Universities; *University Administration

ABSTRACT

This document presents four articles each suggesting that a systems approach is the most practical way of dealing with the complex problems of university planning and administration. The articles are: Students, Systems and Education as Experience; Specifications for a Management Information System for Universities; Systems Analysis and University Budgeting; and Strategies for Change in University Systems. (MJM)

The University of Toledo
D ATION
EDUCATIONAL ENVIRONMENT 1974
ED 090815
PERMISSION TO REPRODUCE THIS COPY-
RIGHTED MATERIAL HAS BEEN GRANTED BY
University of
Toledo
TO ERIC AND ORGANIZATIONS OPERATING
UNDER AGREEMENTS WITH THE NATIONAL IN-
STITUTE OF EDUCATION. FURTHER REPRO-
DUCTION OUTSIDE THE ERIC SYSTEM RE-
QUIRES PERMISSION OF THE COPYRIGHT
OWNER.
U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

ED 090815

EDUCATIONAL COMMENT/1974

The University as a System

Robert T. Sandin
Editor

Contributors

Jack B. Levine and George Mowbray are principals in the Systems Research Group, Toronto, Canada. SRG has been heavily involved in research development and implementation of information systems for colleges and universities in both Canada and the United States. Mr. Levine is an industrial engineer and Mr. Mowbray an economist.

Richard R. Perry is Associate Vice President for Academic Affairs and Professor of Higher Education at The University of Toledo. Mr. Perry holds his graduate degree in education from The University of Toledo. He is past president of the American Association for Institutional Research.

Robert T. Sandin is Director of Planning and Professor of Higher Education at The University of Toledo. His graduate degree in philosophy was earned at the University of Minnesota.

John W. Snyder is Executive Vice Chancellor of The University of California at Santa Barbara. He holds his graduate degree in ancient history from the University of Minnesota.

CONTENTS

Foreword
Robert T. Sandin, Editor 6

Students, Systems and Education as Experience
Richard R. Perry 9

Specifications for a Management Information System for Universities
Jack B. Levine and George Mowbray 24

Systems Analysis and University Budgeting
Robert T. Sandin 39

Strategies for Change in University Systems
John W. Snyder 61

FOREWORD

The assumption underlying this issue of **Educational Comment** is that it is illuminating to consider the university as a system of activities by which certain inputs are transformed into certain outputs. Of course, there are other analogies as well which serve to clarify the idea of the university. In recommending an approach to university planning and administration from the perspective of recognition that the university is a system, we do not imply an adverse assessment of the utility of other metaphors. We wish only to contend that failure to recognize the systemic character of the university is a significant cause of error and superficiality in university planning and administration.

A systems approach to educational planning and administration involves such elements as the following:

1. Design, operation, and evaluation of programs of the university by reference to the objectives (output) of those programs.

2. Integration of program planning with resource planning to ensure that resources (input) are adequate to support planned programs.

3. Allocation of resources to the support of programs in the light of evaluations of program effectiveness as disclosed by operations analysis.

4. Anticipation of the information requirements of systematic planning and rational decision-making and provision for the flow of information in forms and at points required.

5. Recognition of the interdependence of the parts of the university and creation of strategies for educational change in terms of the interactions among the components of the university as a whole.

6. Effective maintenance of long-range planning mechanisms for the improvement of purposive control of institutional development and the reduction of responsive or ad hoc decision-making.

The persuasions on which this volume is based are the following:

1. Better decisions regarding the operation of university programs will result from approaching these decisions through a compre-

hensive consideration of program objectives, resource requirements, and program outcomes.

2. More effective instruction will result from a curricular and instructional approach which recognizes that the experience of the learner is a coherent whole, a system into which the discrete "units" or "packages" of learning must be integrated.

3. More efficient utilization of scarce resources will result from insisting that resource allocation decisions must be made in the light of information regarding the costs and benefits of programs.

4. More useful information about university operations will result from deliberate and careful design of a management information system based on a comprehensive and explicit formulation of actual and potential information requirements of the total institution.

5. More permanent and satisfying change in the processes of education will result from planning for change in any part of the university with due consideration of the impact of that change on other parts of the university.

6. More effective installation of desired changes in the management of universities will result from systematic planning for change, with identification of the steps in implementation, specification of a time schedule for implementation, and assignment of responsibility for implementation.

There may be a touch of naiveté in such convictions. It should be observed, however, that the authors of the articles included in this publication are not specialists in management science, whose thought is dominated by theoretical abstractions, but practitioners in the field of university administration, whose concerns are primarily pragmatic and operational. These authors are suggesting that a systems approach is the most practical way of dealing with the complex problems of university planning and administration.

A systems approach to university planning does not suffer from a lack of detractors. There are university educators who are horrified by comparisons of the university to a business or productive enterprise. But a systems approach to conducting university affairs is much more than application of principles of management science to the university as a resource-consuming enterprise. A systems ap-

proach involves habits of comprehensive planning, of rational program evaluation based on information concerning actual operations, of openness in a cooperative search for more coherent policies and procedures. A systems approach involves an attempt to achieve economy in the provision of needed resources and efficiency in the utilization of resources; but as applied in a university "economy" and "efficiency" must be interpreted educationally, that is, in terms of an understanding of the nature and process of education. It is to the clarification of such an idea of university education that these recommendations for systematic analysis are dedicated.

The Editor

STUDENTS, SYSTEMS AND EDUCATION AS EXPERIENCE

Richard R. Perry

An attempt to describe university level instruction as the systemization of experience necessitates definition of that which is considered to be experience and what is meant by the use of the term "system."

Concepts of experience have their foundations in phenomenological dimensions. Experience as a term which is operational and meaningful in an educational sense requires that the person who is "experiencing" be in fact able to personally and intelligently participate in the chosen experience. In a systems view it means that the individual has the ability to be involved in a communicative fashion with the phenomena which form his environment.

Experience means more and requires more than mere observation. It means more and requires more than mere awareness. It means more and requires more than acquiescence or acceptance of the face validity of phenomena as they are observed and interpreted. Experience in an educational sense means that the individual accurately perceives phenomena, analyzes their component parts, interprets and analyzes the relationships of those phenomena to each other and is able from that analysis and interpretation to predict what effects will be produced as the consequences of the several different sets of relationships which might exist among the phenomena.

Experience in an educational sense represents a totality of developments in an individual from the time of first rudimentary awareness at the threshold of the individual's potential to the full operational ability of the individual reflected in the individual's ability to accurately predict a set of actions for others or in the ability of an individual to construct a new set of relationships from existing phenomena which will create a preferred set of consequences.

Experience in the context of being considered a system requires that the term "system" be considered to be that which describes the characteristics of the relationships which exist among phenomena and the boundaries within which the reactions and inter-relationships of these phenomena are to take place. A system is nothing more or

less than a description of these relationships and interactions of the phenomena of a universe. The size and complexity of the universe will to a large extent limit the complexities of experience which are available to any one person.

In short, it can be said that experience becomes the extent to which an individual can intelligently become involved in the total environment available or to be made available to that person. The system of that experience will be the structuring of behavioral patterns which will enable the individual to accurately perceive, analyze, comprehend, in short, to know the boundaries of the inter-relationships and the components of the system in which he finds himself. Experience becomes, then, the activities by which the individual is able to make use of his sensory equipment, to accomplish the perception, analysis, interpretation and understanding of his environment, and to move in that understanding to the point where he can articulate his understanding to others, with the view in mind of expressing his valuation of that experience and thereby providing his contribution to proposals for change in the environment. Through the evaluation of experience, the individual thus may be able to change the parameters of a system, indeed to change relationships and to change the components of the system themselves. Philosophically, this is a move from the positions of realism and naturalism to the positions of positivism and existentialism.

Paths To Systematic Experience and Higher Education

One can argue from the premise that if experience has been systematically achieved so that the perception is accurate, it is methodologically correct to say that the comprehension which leads to an understanding of meaning resulting from the analysis is valid and that the knowledge is sound enough to perform a reliable predictive function, that a meaningful relationship with and, indeed, mastery of the system has been achieved. Having that, one can be said to possess a knowledge of reality.

The American higher education experience is a classic example of presenting a model for emulation if one is to achieve, be accepted, revered, and develop profitable understandings of reality. It is in the scholarship of the universities that our preferred understandings of reality are achieved. It is in the classroom and in the laboratory of the university that preferred reality is discovered or created. It is in the classroom and the laboratory, in the teaching, and in the re-

search of the university that reality is interpreted, defined, and evaluated for the rest of the population. There are, as Michael Novak has indicated (Novak, 17-19), four basic models of experience in the reality of American universities.

The first promises enlightenment to the student through the achievement of hardheaded empirical experience. The second is the model of the frequently solitary autonomous individual who stands secure in the strength of his achievements and the knowledge which he possesses. The third model is that of achievement through arduous competitive work. The fourth is the model that achievement, indeed, preferred experience, is to be achieved within the system by concentrating on one's functional task. Do your job well and recognition comes. Novak indicates that in the eyes of the university community the person who would be closest to the realism of the system, who would understand it best, who would participate in the most beneficial experience is one characterized as the hard-nosed scholar. This person, in his lonely and heretical toil, would be warmly supported by his colleagues. He would be challenging the values of the community and if lacking immediate rewards, would eventually have the system reward him with some high prize in recognition of his proper experience.

The Aims of Education and Functional Competence in the System

The models of educational experience proposed by Novak are, at least in this writer's mind, the predominant, pervasive, and pressure-packed models offered the student in today's university. While much has been written to identify curriculum innovation and considerable has been done to devise new means of self-motivation, it remains true that the predominant role of the university is the production of the hard-nosed scholar. The reader needs to be careful not to consider that the term "hard-nosed scholar" is offered with anything but the most positive interpretations of the term. It represents a dedication to discovering the truth and that dedication can proceed at the level of a technician as well as at the level of the most sophisticated research scholar.

The first facet of the model of university education suggested, i.e., that of achieving hardheaded empirical intelligence, requires a decision on the part of both the student and the teacher to consider all issues analytically and quantitatively. It is a model which says that one will succeed if one is able to understand and solve the equa-

tions which accurately describe the inter-relationships of the components of a system. If one rejects the equation or produces a different meaning, the interpretation is in question.

The second model, representing the solitary autonomous individual, is one which represents the prized paragon of educational experience in the university; for it depicts that singular individual who because of the excellence of his contributions is respected as a source of academic strength and honored as worthy of emulation. The striking thing that is so often missed in these identifications is that the contributions of such splendid scholarship are of great value only as they are able to enrich, enhance, and make more worthwhile the lives of other people. The aim of education which results from this second model is that the end result of an individual's achievement in the field of his choosing should be the distribution of the benefits of that achievement to the welfare of others.

The third model, that of hard competitive work, is often misconstrued as being the tough, relentless, grinding down of those who are one's partners in the educational venture. All too often the competitive nature of educational experiences in universities leads not only to applause of the achievements of the excellent, but also to consistent criticism of the lack of success of many others.

We are reaching for new goals in higher education, goals which say that the success of one is not the automatic failure of another. There are goals which base program planning of educational experience on assessments of an individual's ability to succeed within a given system. The system of his experience in education is then designed to produce the highest level of achievement for his potential. This needs to be done carefully so that the student realizes that the "competition" in which he finds himself is not designed to annihilate the others in competition in order that he might win, but rather to achieve new levels of experience for himself as a result of the keenness of the competition within the system of his educational experience.

The fourth facet is that of working within the system of education of a university. The educational experience in a university is a highly structured and carefully systematized set of responsibilities and expectations. The carefully structured curricula which lead to clearly defined degrees represent the importance which is attached to understanding that system and thus working within it. It is this fourth facet which reemphasizes and strengthens each of the preced-

ing three. The careful structuring, the systematizing of the curricula, is carried into the very nature and structure of the courses of instruction which, through their syllabi of sometimes great specificity, spell out in detail the components of the total system.

These are basic models which the student of higher education is asked to emulate. They are the models which are rewarded in the long run within the university system. The system rewards the scholar. The system rewards the solitary individual who achieves preeminence in his field. The system rewards that person who works within the system. The system of the university prizes empirical knowledge. Many words are written in defense of the humanistic non-quantifiable and subjective areas of knowledge, but the prize over the long run ends up with the scholars who base their work on empirical evidence. That is not as it should be, for the aims of a university education should be those of producing individuals whose contributions can be turned to the benefit of enriching the lives of others, regardless of whether their contributions based on their educational experiences are the quantifiable products of empirical research or the subjective valuations of interpretive humanism. The goal of a liberal education has forever been that education which will liberate man from the slavery of ignorance. The goal of a university education for the individual is to enable him to use the experience, the knowledge he has systematically acquired, to liberate the lives of all men from ignorance. The ultimate aim of a university education is to produce that person who will unselfishly make his knowledge available in the service of others.

Curricular Goals For Personal Competence

The task of creating a person with competence which can be applied to a system of activities effectively is in its simplest form the matter of so educating a person that he is able to consistently bring to bear effectively all of his skill on problem situations. The systematic procedure which needs to be followed in order to accomplish that kind of education with any expectation of reliable performance on the part of the person to be educated is a straightforward procedure, one which is seldom followed in the large percentage of the cases of curricular planning in higher education.

The operational criteria of the procedure are:

(1) A careful assessment of the entering behavior abilities of the student.

(2) An in-depth analysis of the goals set by the student for himself.

(3) An evaluation of the personal goals of the individual in terms of his assessed potential.

(4) An assessment of the contribution the individual is likely to make to society providing he achieves goals established for himself or achieves goals adjusted to his potential.

(5) The identification of goals to be set for the individual by himself after he has understood the relationship of goals to his potential.

(6) The development of a systematically planned curriculum which will educate the individual for the achievement of goals set for him.

(7) The reinforcement of his every success in accomplishment of the incremental experiences in his goal-oriented curriculum.

(8) The association of a student with models of success in the goal-oriented activities at the earliest possible stage of his curriculum.

(9) The continuous modification of curricular experiences to suit the changing learning abilities of the student.

(10) Provision for the increasing independence of the learner's direction of his study.

(11) Infusing the student's curricula with opportunities requiring him to be increasingly self-evaluative.

(12) Provision for continuous feedback to the student and curricular planners.

While these may seem to some excessively detailed identifications of principles for a system of educational experience, they are nevertheless fundamental to building competence in a person so that he may operate effectively in a system.

It is axiomatic that the design of an educational system will formulate the design of the product in the overwhelming majority of cases. We behave as we are taught. We are what the curriculum educates us to be. Studies from psychology, particularly the behavioral school of psychology, and indeed from political science, almost with-

out exception support this point. The behaviorist approach is a valid position to take in relation to the question of how one builds competence for a person to operate in a system. The first part of the answer to that question is that one must decide first what kind of system it is in which the person is to be encouraged to participate. The educational program, the experience to which the individual will be educated, will then be determined by that system. Experience in that context becomes the operational behavior of the individual in pursuit of competence to deal with a system of activities.

Curriculum planning in higher education would do well to be more systematic. It has been said earlier that the systems approach to curricular planning is not followed generally in higher education. It is not followed in the sense of the full meaning of the systems approach as intended here. Reference to the list of criteria to be applied in that approach indicates that at the very beginning one must carefully assess the abilities, goal orientations, and general level of competence of the individual. Higher education at present is limited to that assessment through devices such as an occasional subject placement examination, a sometime general aptitude testing, and a sometime personal counseling assessment experience for the student. None of these, as limited as they are in their usefulness, is applied universally to students. The assumptions which abound today in curricular planning are that the curricula which have served as a model for higher education experiences for the past 50 years are still generally useful models for the present day.

We have witnessed great changes in content of curricula offered in higher education but the very first criterion of a systems approach is infrequently adhered to. That criterion is identification of a goal compatible with the student's potential. Curriculum revision does go on constantly in colleges and universities. While major revisions are undertaken with careful examination as to the necessary changes in content, direction, and skills which students are to achieve, little if any input to the curriculum revision is sought directly from students in the program and even less so from large numbers who have graduated from the curriculum. Revision of curricula and particularly the planning of individual courses requires being explicit about: (1) What kinds of knowledge are students expected to acquire? (2) To what purpose is the knowledge to be put once it is acquired? (3) How is the information of a course best organized in order to be communicated to the students? (4) How can one impose or develop inductively a value orientation for the content of the individual course and the entire curriculum? The weakest part of the organization of edu-

cational experiences which result from present curricular planning is in the assessment of the abilities of students and in the evaluation of the effects of curricular experiences on students.

Total effective curricular planning means implementation of an informational system which provides for input from all segments that will be affected by the results of the proposed learning experiences. Continual improvement and widening of the information net is necessary for improved curricular planning. This has been achieved in recent years in higher education as colleges, universities, and community colleges have sought to involve curriculum planning with students of those departments and colleges and also to include alumni of the departments and colleges, representatives of the profession, business, industry and community agencies. This widening of the curricular planning information net has been forced generally because of the pressing needs to reorganize academic programs to meet newly identified goals for new kinds of students not presently attracted to existing curricular models.

The aims of education at the university thus become as diverse as the needs of the students it must serve. In a systematic sense, those aims become the purposes and the goals of each course of instruction. This requires the professor to identify in a systematic fashion the procedures associated with the proposed educational experience and the relationship of those procedures to the curriculum. The behaviorist would be asking in a systematic fashion, "What specific activities must be engaged in by the student and the professor?" and "What specific experiences are to be made available under what conditions in order to bring about anticipated changes in student behavior?" It would not be sufficient to indicate merely that a student is expected to accomplish a level of education which will permit him to perform specific acts in a behavioral sense. A systematic approach to preparing the individual student to function competently in the system of activities associated with the goal of an educational experience would require the detailing of the specific kinds of methodologies to be employed in teaching even in a single course of instruction. The answers to these questions will be different for each curriculum, for a uniform instructional methodology and curriculum plan is not acceptable for the creation of the diverse kinds of experiences necessary to prepare individuals for effective involvement in diverse systems of activities.

Agreement on the aims of education and the consequent planning for curricular experiences to reach those aims is not expected. If

that agreement is reached universally, education will stagnate. The major responsibility of educators is to continually question goals, objectives, and task specifications in the context of creating appropriate educational experiences for an increasingly diverse student body.

Competence to participate effectively in a system of activities is dependent upon the quality of the educational experience to which a student has been exposed and most importantly to the fitting of that educational experience to the particular needs of the student in relation to the place he is expected to occupy in the system of activities. This suggests specialized attention to fitting individuals for particular roles in society. Great importance, therefore, must be attached to the continuous evaluation of the educational experiences provided students. A process of continuous questioning of the effectiveness of the program must be under way.

An outspoken proponent of creating educational programs related directly to student needs is Ralph Tyler (Provus, 150). Our present interests in higher education about evaluation seem to be weighted toward evaluating the success of the student in achieving carefully prescribed goals which are often not directly related to the individual needs of the student. The Tyler approach, as explained by Provus, shifts the emphasis of evaluation from the achievement of the student to the effectiveness of the academic program in supplying educational experiences which will lead a student to levels of competence appropriate to his potential. There is a sharp and important difference. That sharp and important difference, while identified **a priori** by some, would nevertheless be made explicit by the application of a systems analysis approach to curriculum planning. That approach would force the completion of a feedback loop in the curriculum planning cycle which would disclose the effectiveness of an educational program's achievement in relation to creating more highly competent persons.

Basic Knowledge of Systems Analysis Necessary For The Student to Exploit His Competence in Society

The basic principles of systems analysis can be applied to any situation in which an individual finds himself. To be sure, the time frame within which the analysis must take place varies sharply with the incident in which one is thrust; nevertheless, the basic precepts of systems analysis apply. These are the recognition of the goal to be achieved, the identification of specific objectives which will permit

goal achievement, the definition of a time frame within which the objectives are to be reached, an analysis of the task which must be performed in terms of specific operational activities, and, lastly, the defining of specific behavioral objectives associated with each operational activity and the goal in order that appropriate behavioral objectives may be identified.

The identification of the behavioral objectives is of as critical importance as any other step in the analysis, for it is in these objectives that one defines exactly what behavior must be elicited in order for a person to achieve a particular goal. Achieving that goal requires the individual to have performed certain tasks, and as a result of those tasks he will have had certain experiences and as a result of those experiences achieved certain clearly defined objectives and having achieved all of the objectives the person will have accomplished the goal. While behavioral objectives may be on the lowest rung of the hierarchy ladder in the listing of objectives, that position bears little relationship to their importance in systems analysis for education. A diagram of the concept is presented in Figure 1.

The entire fundamental planning concept associated with systems analysis might be diagrammed as in Figure 2.

Figure 1

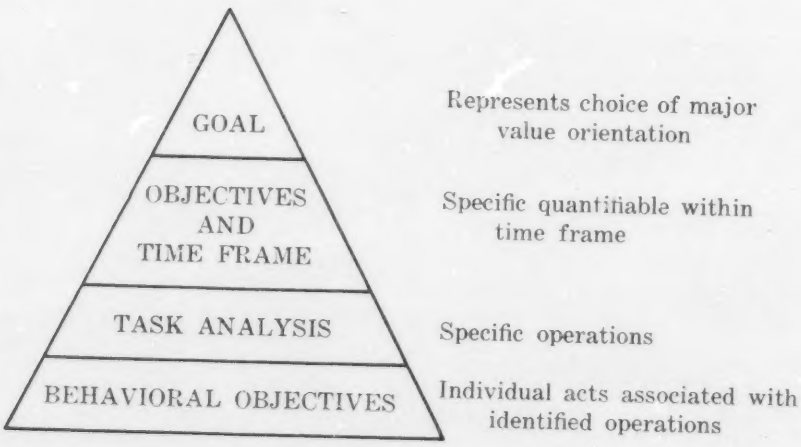
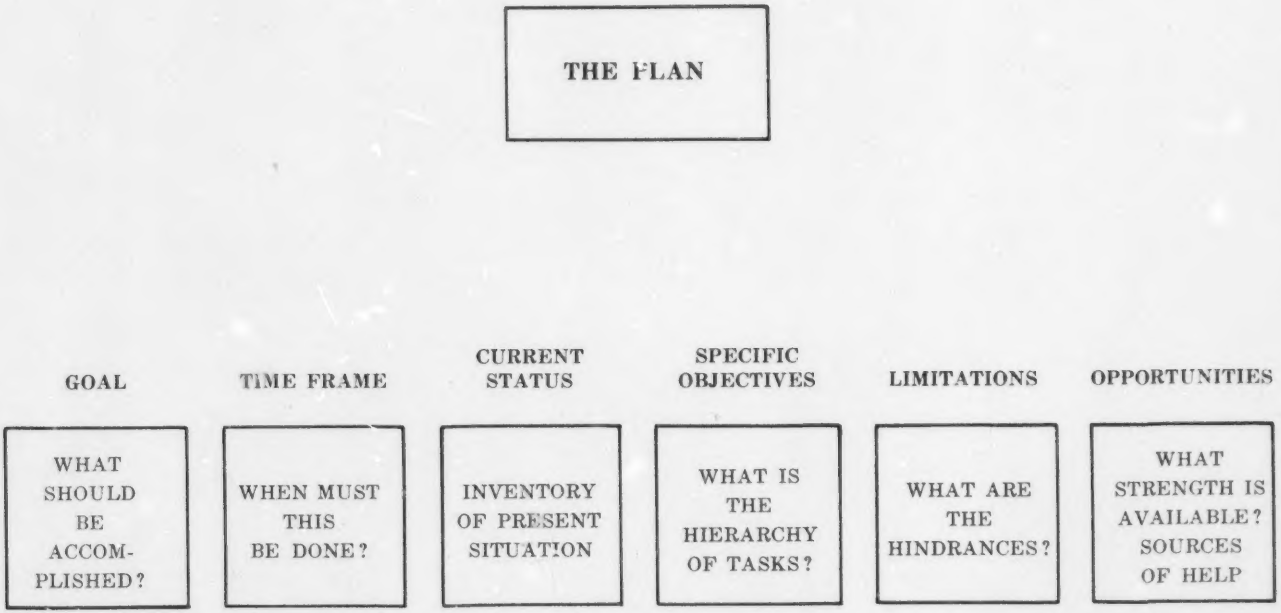


Figure 2


THE PLAN
GOAL
WHAT SHOULD BE ACCOM-PLISHED?
TIME FRAME
WHEN MUST THIS BE DONE?
CURRENT STATUS
INVENTORY OF PRESENT SITUATION
SPECIFIC OBJECTIVES
WHAT IS THE HIERARCHY OF TASKS?
LIMITATIONS
WHAT ARE THE HINDRANCES?
OPPORTUNITIES
WHAT STRENGTH IS AVAILABLE? SOURCES OF HELP

Student Knowledge of Systems Analysis

In the early part of this thesis it was suggested that a system was considered to be that which describes the characteristics and relationships existing among phenomena and the boundaries within which the reactions and inter-relationships of these phenomena are to take place. A more operationally oriented definition of the term would be to say that a system represents the gathering together of methods of procedures and techniques so that they are united by a regulatory interaction which creates an organized whole. A purely industrial orientation to a definition would be to identify a system as an aggregation of workers, technology, and production methods which are required to accomplish a set of specific functions; in short, the organization necessary to produce a particular product.

The student involved in higher education finds himself challenged from the beginning to understand the system of higher education. The student must be able to understand his course of instruction, his curriculum, the methods of operations of his professors, the framework of competition with his peers, the system of goals established for him and those he will set for himself. As a student works with this complexity he is thrust immediately into systems analysis. Whether he understands it by the term "systems analysis" or not, he is involved in trying to analyze the system. It is useful for the student to know:

> "A formal procedure for examining a complex process or organization, reducing it to its component parts and relating these parts to each other and to the unit as a whole in accordance with an agreed upon performance criterion." (Borko, 37)

The principal characteristics of systems analysis which need to be in hand by a student if he is going to develop a competence in societal systems and particularly if he hopes to exploit that competence are as follows:

(1) A fundamental characteristic is the systematic examination and comparison of alternative courses of action that might be taken to achieve specified objectives for some future time. It is important not only to systematically examine all of the relevant alternatives that can be identified initially, but also to design additional ones if those examined are found wanting. Finally, the analysis, particularly if thoroughly and imaginatively done, may frequently result in modifications of the initially specified objectives.

(2) Critical examination of alternatives typically involves numerous considerations; the two main ones are assessment of the cost (in the sense of economic resource cost) and the utility (the benefits or gains) of each of the alternatives being compared to attain the stipulated objectives.

(3) The time context is the future — often the distant future (five, ten, or more years).

(4) Because of the extended time horizon, the environment is one of uncertainty — often great uncertainty. Since uncertainty is an important facet of the problem, it should be faced up to and treated explicitly in the analysis. This means, among other things, that wherever possible the analyst should avoid the exclusive use of simple, expected value models.

(5) Usually, the context in which the analysis takes place is fairly broad (often very broad) and the environment complex, with numerous interactions among the key variables in the problem. This means that simple, straightforward solutions are the exception rather than the rule.

(6) While quantitative methods of analysis should be utilized as much as possible, because of items (4) and (6), purely quantitative work must often be heavily supplemented by qualitative analysis. In fact, I stress the importance of good qualitative work and of using an appropriate combination of quantitative and qualitative methods.

(7) Usually the focus is on research and development and/or investment-type decision problems, although operational decisions are sometimes encountered. This does not mean, of course, that operational considerations are ignored in dealing with R & D and investment-type problems. (Fisher, 207)

When the student has the above criteria in mind he will have a more compact understanding of what constitutes a system; that being the delineation of all components needed to accomplish a particular goal. In the simplest terminology, the student needs to understand that any system is represented by inputs, processing, and outputs, and that these three are dependent entirely on a careful definition of the goal to be reached. The student's understanding of systems will need to include a comprehensive understanding of himself as well, for in his relationships to societal activities it is the person who is the processor. The achievement of goals, the inability to handle input, and to change input into effective output will, as far as the student is concerned, depend greatly on the constraints that must be

placed on the building of the system represented by the limits of his potential. The student needs to avoid injecting himself into situations which are beyond his ability. Knowledge of systems analysis will help him. All systems run the dangers of overload and are rendered completely ineffective and incapable of effective outputs if overloaded.

It will be important for the student to understand the boundary concept in systems. The limits of any system are represented by its boundaries. The individual, for example, can construct a system which represents the multiple roles the person will play within a set of situations. These will become only one of the components in the total system. Others could be specific behaviors, expectations, the communications of the individual, his influence and his ability to manipulate other persons. Unless the student is aware and capable of identifying boundaries of the systems with which he will have to work, he will be forever trying to understand why he has not been able to account for all of the variables which affect his goals. As a student directs his attention to the boundaries of the societal and institutional systems in which he finds himself, he will immediately find that these systems are integrated horizontally, vertically and longitudinally. An example of horizontal integration of the higher education system for a student would be its admission process, and particularly at the college the student wishes to attend. The system is integrated vertically in the sense that the college represents one component of a total education system of the society in which the student lives, others being the graduate schools above his undergraduate college and the secondary and elementary schools below the college he wishes to attend. The higher education system is integrated longitudinally because the information which is available about the student continues from the time he enters the school or college until long after he has graduated. An understanding of these three characteristics of systems will illuminate an important point necessary in the understanding of efficiencies to be expected in using systems — that being that all are related to a definite time frame.

It should be sufficient for the student who is not professionally interested in formal systems work to understand systems in the sense that they apply to his personal relationship and competence in society by representing order, purposeful behavior, and organization. These characterize a state of mind which has proven helpful in seeking solutions to his problems. The student who has an adequate knowledge of systems analysis at his command will be in a position to generate

operational decisions which will lead to success not only for himself but for others affected by his decisions.

Novak, Michael, THE EXPERIENCE OF NOTHINGNESS, New York, Harper & Row, 1970, pp. 17-19.

Provus, Malcolm, DISCREPANCY EVALUATION FOR EDUCATIONAL PROGRAM IMPROVEMENT, Berkeley, McCutcheon, 1971, p. 150.

Borko, H., DESIGN OF INFORMATION SYSTEMS AND SERVICES in **Annual Review of Information Science and Technology,** ed., C. A. Cuadra, New York, Interscience, 1967, II, p. 37.

Fisher, G. H., THE ANALYTICAL BASES OF SYSTEMS ANALYSIS, Santa Monica, Rand Corp., May 1966, p. 3363. Also printed in D. I. Cleland and W. R. King, SYSTEMS, ORGANIZATIONS, ANALYSIS, MANAGEMENT: A BOOK OF READINGS, New York, McGraw Hill, 1969, p. 207.

SPECIFICATIONS FOR A MANAGEMENT INFORMATION SYSTEM FOR UNIVERSITIES*

Jack B. Levine and George Mowbray

MIS Is Alive, Well and Ready for Academe

The arts of Management Information System planning and development are finely tuned, available, and ready for introduction into higher education on a scale never before possible. Costs of information system improvement are lower, and potential benefits are greater than ever before. And yet, after many years of discussion and research on information systems problems, most universities remain several steps away from realizing such a potential—a good, well-rounded system that would help them with program evaluation and management control generally. We know from our own experience that this seeming inability to draw on the information technology of the space age is not mainly a technical problem. It begins with a difficulty that most people have in trying to explain in detail their information requirements. Even given the statement of needs, it seems to be even more difficult for institutional leaders to view these requirements in the context of an institutional information **system.** The problem of management reform, of getting better information to make better decisions, is more "social" than "technical."

We, therefore, are going to suggest a way of grappling with three important problems in management information systems development in universities: first, the problem of understanding the basic nature of an information system in a college or university; second, the problem of using this understanding to establish directions and priorities for information system improvements, and third, the problem of actually implementing changes in such a way that the changes will be perceived by the members of the institution as being generally supportive of their and the institution's goals. In summary then, what is an MIS, how do we build one, and how do we get it to work smoothly and usefully?

After a number of years of experience in trying to relate systems approaches to the self-perceptions of educators, we have concluded

*This chapter has a dual emphasis: first, to provide a practical conceptual scheme for the development of college and university information systems; and second, to suggest ways of using a general checklist of system components in system implementation.

that a number of steps **can** be taken to help ensure successful MIS implementation. These steps represent the practical results of our personal work, a "systems research" path along which a number of our earlier illusions fell by the wayside.

Perhaps the most important thing for people to understand is that every college or university has the kind of information system it deserves. Any so-called MIS is nothing but a phantom if it does not reflect the perceived needs and interests of the members of the community it is supposed to be serving. The fidelity of this service is certainly more related to the goals and ideas of the people who are working in the institution than it is to any abstract scientific notion of what they **should** know.

One of the fundamental conclusions that emerges from our MIS work is that the processes of educational reform begin in the minds and hearts of educational managers. Without a serious resolve on the part of these people, any attempt to overlay improved information systems is likely to be of little benefit. The educators in the institutions considering information systems improvements have to understand that it is not the systems analysts and the systems that will be primarily responsible for the success of information system change, but they themselves—the top people who will use the information to make better decisions. Better decisions will be as much a product of the resolve to make better decisions as they will be of the productivity of the information itself.

So the idea that MIS is alive, well, and ready for academe has to be qualified with an environmental reference. People have to be ready for change. The analytical tools usually have to be tailored to the needs of the institution using them. Computer programs are very pernickety and not readily transferred without a friendly pat on the back and a bit of brushing up. They may even require substantial modification. Management information system development in a university is likely to be a very inventive journey of self-discovery. One of the glories of the computer is that under some circumstances it can provide a magic carpet for journeys to the inner recesses of the mind. In so doing, it can take educators into new realms of decision-making and into new kinds of variable analysis that yield great benefits. In institutional management more than in some other fields of endeavor, knowledge is power.

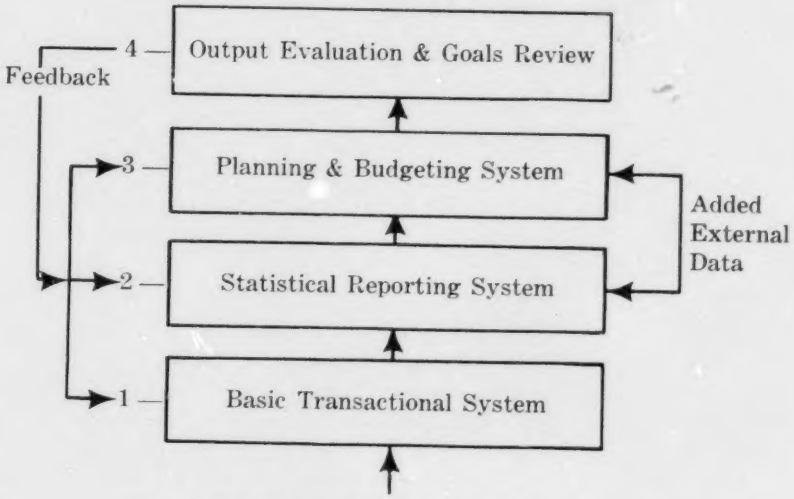
We have, then, the peculiar situation where systems approaches can be futile, and the specifications for a better MIS meaningless, if

key people do not understand the need for change and the need for their own active participation in system re-design. Fortunately, most educators can readily grasp the main ideas underlying information system development. The subject is neither as esoteric nor as technical as most people think. What is required is a set of ideas and concepts for converting the MIS wraith into a practical real-life servant of education. This rather grand objective is the central focus of this commentary.

A University MIS is a Quadruped in Need of Planning

As a result of our experience in the conceptualization, design, implementation and support of management information systems in several dozen colleges and universities, we have concluded that a university information system can be very conveniently thought of as a four-legged animal, or a four-part system. The parts of the system are related but not strictly interdependent. One or another may have a different emphasis at different times, but all should be considered as part of an information system planning process:

Management Information System



Information System Master Plan

In the scheme of a Management Information System, a "master plan" for the system is shown as guiding the development of four quite distinct, though related, MIS component subsystems. This conceptual scheme has served us well for many years, helping educators sort out their information needs and decide on priorities of change, and encouraging the "top-down" interest that we believe is so necessary for successful system change.

1. Basic Transactional Systems

Every college and university has—indeed, must have—a student information and general accounting system for looking after its day-to-day operations. Students have to be recruited and admitted, aided, charged tuition and fees, assigned to chosen courses. Staff members have to be hired, assigned tasks and paid. The physical plant has to be looked after and many kinds of equipment and supplies have to be purchased. All this requires information, based in most cases on fairly traditional procedures of educational administration and accounting.

Unfortunately for most educators, their basic operating information systems have too little direct connection with the educational process as such. Such systems, insofar as they concern resource allocations, are usually designed around cost center (departmental) structures and classifications of expenditures according to their object (salaries, travel, supplies, etc.). In short they explain what money is being spent **on**, rather than what it is being spent **for**.

Basic systems are, however, very necessary. Our comments on their shortcomings are not meant to imply otherwise. Internal administrative accountability and the laws and customs of public accounting all indicate the need for good day-to-day control, for verification procedures, and for incentives to honest resource use.

2. Statistical Reporting Systems

The most obvious statistical reporting categories are those directly emanating from the basic transactional systems — operating statements and balance sheets, enrollment counts, student receivables, accounts payable and receivable reports, etc. Nowadays, however, a typical statistical reporting system has to go beyond these rather basic reports to new ones requiring external data—i.e., data external to the primary systems within the institution. Examples: student

reports that analyze the characteristics, social origins, career paths, interests and ideas of students; special staff reports that may relate educational experience to present work, hold professional data, such as titles published, or identify various kinds of activity carried out on the job.

Statistical reporting systems, depending on their completeness or sophistication, may have one or more of several characteristics. They may be:

(a) Directed primarily to internal or to external audiences (or both). Examples: the planning committee, president, trustees, state board of higher education, USOE, alumni.

(b) Connected with some element of "control" over the affairs of the school. For example, an enrollment report that showed a sudden increase in attrition might prompt corrective actions; or a periodic staff inventory report might draw attention to the "affirmative action" program.

(c) Concerned with either the recent or more distant past, but in any event are always "historical." In MIS terms, there is no "present"—only the past and the future. Hence the history of recent or more distant actions and conditions may inspire a futuristic response: (1) we do something right away, or (2) we decide to improve our ways of doing things in the next or more distant period. In this sense, the concept of "control" merges with that of "planning."

(d) Very important to the survival of the institution: (1) in enabling internal control, and (2) in satisfying external publics that may be vital to operational or capital funding.

(e) A liberator to educational executives who otherwise become "super clerks." An appalling amount of educational management time is spent in the compilation of statistical reports that should be retrievable from an output-oriented data base. The greatest gain from a good statistical reporting system may well come from its contribution to executive think-time.

3. Planning and Budgeting Systems

Planning and budgeting deal with "futuristics," not history (except as history affects the future). No field of management respon-

sibility in education is in greater need of new tools for decision-making. Even more important than analytical instruments is the resolve to make better plans and to seek the means for making more considered choices. The challenge today is to do these things in order to **survive.** Because they lack responsive attitudes to future portents, hundreds of American colleges will die in this decade.

What will give us more effective planning and budgeting? The most important answer is that we need to bring academic planning and financial budgeting into a harmonious relationship with each other. This means that we need a bridge of some kind, to link the aspirations of the academician and the practical reasonings of the financial officer. If colleges were managed a little more like businesses the marketing concept would readily provide a conceptual scheme—a focus on the relevance to student needs, and hence community needs, of the educational services (programs) delivered. If a certain level of student enrollment is judged to be essential to the future of any given institution, then the faculty and administration simply have to work together to support its future. Such an approach has a parallel in political life, in the aphorism that the first duty of a statesman is to get elected. In education, we have called this idea the concept of "enrollment management." It implies much more than information system development, although this aspect is important.

It seems to us that one of the main objectives of any kind of planning and budgeting system should be to reduce future uncertainties and risks. This objective may imply several things: better knowledge of probable future conditions, more careful consideration of alternative plans to dovetail with future conditions, manipulation of the internal or external environments to achieve desired (but otherwise unattainable) future states, and a stockpiling of responses to possible "surprises" that may turn up as the scenarios of the future unfold.

In terms of present-day academic management styles, the challenge of modern approaches to planning and budgeting can be bluntly stated: it is to abandon the traditional budgetary philosophy of "intuitive incrementalism" in favor of an attitude that embraces bolder innovations and more rapid change in academic goals, programs and learning methods.

The much misunderstood PPB concept of "planning, programming and budgeting" can be very useful if applied sensibly to educa-

tional management. And it can be equally useful in helping educators re-design their information systems. An information system calls for output objectives, for actions (programs) to collect, store, retrieve and analyze data, and for results that will help users evaluate their situations and make indicated improvements. Like the institution it serves, a MIS is likely to be a continually changing set of responses to the need for institutional control and planning. One of the main cautions that PPB offers to the MIS planner is for him to be sure that system design and implementation are worth what they cost in time and money. Unfortunately, costs are certain and benefits sometimes hard to quantify in advance. The fact is that new MIS procedures typically **create** problems. New facts and new analytical tools open up new areas for problem definition. They do more than just make problems more specific and choices between alternatives more scientific and more considered. Herein lies the essence of modern reform in educational budgeting: a new, cooperative modus operandi between all the principal communities of the university to ensure not only its survival but its optimum flexibility in defining and responding to the needs of our changeful society. The academy both creates and ameliorates future shock.

4. **Output Evaluation and Goals Review (feedback)**

Compared to historical activity analysis and the understanding of costs and revenues, the evaluation of institutional outputs, goals, and direction of change are esoteric indeed. Much attention is being paid these days to the **why's** of university decision-making. Such questions transcend program analysis and choice between alternatives in curriculum structure and teaching methods—and in fact determine the list of acceptable choices. Comparative costs or options on methods of instruction may enable a university to improve its future resource management, but its goals and values will determine whether or not a degree program in Applied Witchcraft can even be contemplated.

The information system requirements in the four levels we have described—transactional, statistical, planning and budgeting, and output evaluation—each successively requires a higher proportion of "external" data. This can be readily seen in output evaluation and goals review. Since almost anything is possible at the level of the delivery system, the review of performance and goals becomes intimately dependent on social rather than institutional research. How are the needs of our society (or our area of the nation) changing?

How do graduates now view their educational experiences? How is the demand for various skills shifting? What does the accelerating liberation of women have to say about institutional development policy? How will lifetime education concepts affect the "campus?" These and other such questions certainly demand information as well as very large dollops of judgment. The answers to them have a profound effect on the university—in the first instance on its planning and budgeting system, and thereafter on its statistical reporting and day-to-day operations. A high-level feedback system thus crowns the MIS. It drives the whole institution and affects its lower-level information systems as well.*

An Information System Master Plan Makes It Much Easier

Just as a university can benefit from a master plan of its future facilities and program activities, so it can benefit from a parallel plan for its overall information system. Such a plan is not really very hard to formulate. Nor need it be complex and smartly integrated in all its manifestations. But it can be very useful.

1. Why have an MIS Master Plan?

Planning the functions, structure, data elements, and input/output characteristics at each of the four system levels we have described, confers several benefits, not all of them intuitively obvious:

- Clarifies organizational structure, job responsibilities, along with related information needs;
- Throws light on hitherto non-existent or hidden policy issues (credit hour definitions, staff loading rules, space utilization, attrition, etc.);
- Promotes the idea of more open, cooperative decision-making by faculty and administration;
- Helps ensure that there will be no serious gaps in system components;
- Focuses attention on the costs and benefits of information;

*One of the ironies of MIS planning and development in higher education has been the inverse relationship between costs incurred and benefits derived. Large sums have been spent on computerized transactional systems where the educational payoff is least. Moderate sums have gone into statistical reporting where the benefits are modest. Little has been spent on integrated planning, budgeting and futuristics, where the payoff is very great. Almost no systematic effort has been devoted to conscientious evaluation and goals review where the costs are relatively small and the potential benefits astronomical.

- Reduces duplication and useless reports;
- Contributes to computer hardware and related staff planning by making possible a coherent statement of probable processing loads at future intervals and at different times during the day, week, month and year;
- Requires decision-makers to make a conscious analysis of their information system options—and to make formal decisions on system development priorities and an implementation timetable.

In the balance sheet of "benefits" we have found to our surprise that the self-examination implicit in an MIS Master Plan project is often as useful as its more obvious results.

2. An MIS has a Standard Structure that Helps in the Master Plan

Our research in systems design and implementation over the past ten years or so indicates that although all institutions are unique, the primary check list of their MIS components is not. Of course, each institution will demand its own unique features. Some will be more ambitious than others (for good reasons) in terms of their plans' comprehensiveness. The computer may be large, small, or nonexistent. But it still helps to begin with a Standard MIS Structure and go from it to needed variations.

What should an MIS Master Plan cover? Here is a structural definition that we have found to be a useful starting point:

(a) Organizational Analysis

An organizational analysis has several facets, each of which throws its own particular reflective light on the criteria of MIS design. The basic structure of the university has to be "seen to be relevant" by the key people. If not, it should be modified. An MIS planning project should therefore begin by confirming or redirecting the primary structure of the university. Personalities aside, we would say that most institutions of higher education are reasonably well organized, although changes may be indicated by their desire for new ways of doing things (such as those implied by the "enrollment management concept").

(b) **Transactional (Operating) Systems**

We have made up the following check list of basic operating systems, for "gap identification" and/or subsystem improvement:

ADMISSION
- Application
- Evaluation
- Confirmation

FINANCIAL AID
- Application
- Evaluation
- Confirmation

RESIDENCE
- Preparation
- Application
- Confirmation
- Registration

REGISTRATION
- Master Schedule
- Preparation
- Preregistration
- Registration (in person)
- Registration Change

HEALTH SERVICE STUDENT RECORD
- Preparation
- Grade Processing
- Evaluation
- Transcripts

DEVELOPMENT
- Graduate Follow-Up
- Fund Raising —File Preparation
- Fund Raising — Solicitation
- Fund Raising — Donations
- Portfolio — Transactions
- Portfolio — Valuation

STAFF
- Position File
- Hiring
- Assignment
- Termination
- Update
- Payroll

PURCHASING
- Purchase Order Preparation
- Purchase Order
- Update
- Quality Control

ACCOUNTING
- Types of Accounts
- Identification
- Aggregation
- Account Format
- Chart of Accounts — Printout
- Chart of Accounts
- Agency File
- Account Master File
- Encumbrance
- Advances
- Invoices Liquidation
- Payroll
- Financial Aid
- Billing
- Budgetary Control
- Receipts
- Trial Balance
- Personal Accounts
- Closing the Books

FACILITIES MANAGEMENT
- Inventory
- Utilization
- Capital Projects

(c) **Statistical Reporting Systems**

The ideal statistical reporting system has what might be called a "variable report generator"—a system under which reports can be called up from primary data files on whatever format the user desires. Variable report generators typically require large computors and a degree of software sophistication not readily attainable.

A reasonable first step in the direction of better statistical reporting is to define a limited set of "fixed format" reports for which a restricted list of input data elements can be defined and collected. The definitions of outputs and hence of inputs are, of course, determined by the purposes and intended audiences of the statistical reports. Some will be **external** to the university, others **internal**, and a good many will be both.

Typical reporting areas are the following:

STUDENTS
- Background (admissions file)
- Educational activities
- Attrition
- Graduation
- Postgraduate achievements (alumni file)
- Curricular feedback

STAFF
- Origins
- Educational and other experience
- Instructional loads
- Other activities
- Titles published, honors, etc.
- Rank distribution
- Costs

SPACE
- Institutional
- Campus
- Building
- Category
- Subcategory
- Size
- Utilization

FINANCE
- Course costs
- Program costs
- Departmental costs

Institutional summaries
Endowment portfolio
Investment yields
Operating statement
Balance sheet

(d) **Planning and Budgeting**

The basic transactional systems, the statistical reports, and various external data all contribute to the third level of information use—planning and budgeting.

A modern planning and budgeting system **must** be rooted in academic considerations, not those associated with traditional bookkeeping. **A primary purpose for overlaying traditional budgeting procedures with academic planning** (program review and forecasting) **is to protect planning by making departmental budgets dependent on a prior planning exercise.**

Given the integrated approach implicit in modern university planning and budgeting, one can define the implied general structure of information requirements:

HISTORICAL
- Last year's actual operating experience
- This year's budget
- This year's actual operating experience
- Program analysis
- Departmental (college aggregate reports on resource use)
- Cost details (academic and support departments, programs, courses, credit/contact hours)
- Revenues

FUTURE
- Arrayed cost/revenue alternatives for choice in academic planning
- Next year's budget
- Next 2-5 years' budgets
- Departmental commentary
- Final decision for next year's budget (cost center allocations)
- Financing policies (long and short-term)

(e) **Output Evaluation and Goals Review**

No very definitive information requirements can be postulated as

a general recommendation, but the following areas need to be supported with internal and external data:

- Factors likely to affect university survival or growth;
- Definition of "market area and segments" to be served, implications for curriculum planning;
- Implications of the open university, continuing education, new instructional media including cassettes, TV, programmed instruction books, group self instruction, extramural examination privileges, etc.
- Coeducational policy, women's liberation effects, possible changes of distribution of sexes in probable enrollment in future programs.

3. How to make and apply an Information System Master Plan

An Information System Master Plan can be formulated at any one of several levels of detail: (1) general plan, (2) component systems defined, (3) component systems flow—charted with data element definitions, (4) all the foregoing plus selection and/or writing of specifically applicable computer programs.

While planning methods are obviously affected by the level of detail decided on, the process also has a number of recommended steps. These, at least, have proved relevant in our own experience:

(a) Confirm Organizational Structure

An information system depends for its form and content on the needs of people who work in established relationships at their appointed tasks. Hence the first step in an MIS plan is to record the existing job structure and principal duties of its incumbents. Any major changes now foreseen should also be noted at this stage.

(b) Identify Perceived Information Needs and Present Flows

This step is essentially an "information gap" analysis. It enables the MIS planner to see the outlines of the systems required (existing or non-existing). Part of this step consists of a review of present or proposed computer hardware and computer center staff. In some cases questionnaires may be proven useful here.

(c) **Review Findings in Relation to Standard Structure**

Check the current findings against the standard check list of needed systems, noting any deliberate omissions from the emerging plan, as well as special features needed but not in the list.

(d) **Set up for the Needed System Development Steps for Priority Decision on Implementation**

Since not all elements in an MIS are equally important or of comparable implementation cost, the users of the proposed system should decide what to do first and why. A "decision matrix" can be useful at this stage, laying out options and stating criteria recommended for deciding priorities (cost, benefit, elapsed time needed, internal resources needed, external resources, computer implications, etc.)

Decide on Implementation Steps and Establish a Work Schedule

Like any other set of plans, an MIS Master Plan needs a formal implementation schedule. When people's working environment is to be changed, **social** aspects of making the changes must be carefully considered. In information system changes, the penalty for ignoring the psychological factors can be severe—to the point where MIS becomes a witch word and its implementation abortive or worse. An implementation plan thus should begin with orientation and the involvement of many people, especially those who may perceive the proposed changes as a threat or at least a cause of uncertainty.

An implementation schedule need not be terribly complicated. But since major information system changes are likely to affect data element definitions and hence first-level collection procedures, one has to be careful not to disrupt established procedures in the course of implementing new ones. This precaution, plus the aforementioned care with people's feelings, are perhaps the two most important things to keep in mind.

Other implementation elements are perhaps more obvious: (1) decisions on making or buying computer software; (2) use of in-house or outside computer, or both; (3) testing and de-bugging subsystems before completing the whole job; (4) ensuring an adequate interface, likely a person, between the key users of the new systems and the data processing center; (5) suitable manuals and other documentation.

Just as campus master planning raises new questions and suggests new directions for the university, so does the Information System Master Plan which should parallel it in concept. Planning is, after all, our self-constructed bridge to the future. Today, when innovation is confronting tradition in so many aspects of the university, information becomes a resource worth considering in investment terms.

SYSTEMS ANALYSIS AND UNIVERSITY BUDGETING

Robert T. Sandin

In the past decade there has been a noteworthy increase in research and publication concerned with the application of analytical planning techniques in higher education. From the point of view of the technology of such planning, there has been an important research breakthrough during this period. The principles of analytical planning for higher education have been clarified and computer software to establish an information base for analysis has been created. The implementation of the new technology, however, remains largely a hope of the researchers, whose recommendations for reform remain to this date largely formal and abstract. The "managerial revolution" in higher education, still keenly anticipated by the conscientious, has not yet fundamentally affected the budgeting process in most universities.

The budgetary practices of the universities still are characterized by a number of weaknesses which reflect their failure to approach the task of resource allocation from the perspective of recognition that the university is a system. Among these weaknesses are the following:

1. A piecemeal approach to building the budget, usually beginning with the commitment of whatever resources are required to achieve a satisfactory salary increase for the staff and ending with the commitment of what remains for equipment.

2. A tendency to approach planning for the utilization of resources primarily from the perspective of a fiduciary concept of stewardship owed to the suppliers of funds, rather than from the perspective of the duty to optimize the productivity of the institution in relation to its mission.

3. Planning for the continuation of programs without a clear concept of the purposes to be served by such programs or without a warranted belief in the utility of such programs as means for realizing specifiable ends.

4. Separation of planning to spend from planning to fund, with resulting conflict between those who consume funds and those who must procure them.

5. Separation of fiscal planning from academic planning, leading to the frequent vetoing of academic planning and aspirations by fiscal officers.

6. Failure to establish a long-term context for short-term decisions regarding program support.

7. Separation of planning for current income and expense from planning for capital income and expense.

8. Pursuit of an intuitive approach to decisions regarding resource allocations in an institutional context whose complexity exceeds the intuitive powers of even the most gifted human individuals.

Such weaknesses in university financial planning are directly traceable to the inadequacy of systems analysis. They are, in turn, the cause of many mistakes in the administration of university resources and of much waste of both public funds and philanthropic largess. The failure to approach budgetary planning from the point of view of recognition of the systemic character of the university means that in many instances momentous educational decisions are reached without full knowledge of the financial implications of such decisions and, conversely, that financial commitments are made without regard for the priorities of responsible educational judgment.

In the absence of a systems approach to budgeting, universities are often unclear about their purposes and priorities, or they find themselves, in fact, pursuing purposes which they would be embarrassed to profess. Lacking adequate information concerning the relative utility of alternative programs as means for accomplishing their objectives, universities persist in supporting programs without knowing that these programs are, in fact, optimal from the point of view of resource utilization. The pressure of ad hoc planning leads universities to overlook hidden or long-range costs of establishing new programs or constructing new facilities. And selective use of available analytical information often becomes, in the hands of the generally gifted people who manage the universities, a powerful tool for rationalizing their subjectively derived preferences for program support.

It has become vacuous to warn that the luxury of traditional budgetary practice can no longer be afforded by the universities in the light of the growing scarcity of resources and the increasing demands for accountability in the use of public funds. Several years of

such warnings have been largely ineffectual. It is time for a few universities to effectively implement the managerial reform which is so widely thought to be desirable and to install operational precedents for other institutions to follow. I hope in what follows to offer encouragement for concrete steps toward implementation of a systems approach to university budgeting.

Functions of a Budget

Many persons in academia view the budgetary process as a necessary evil, which can be tolerated best if it is kept at a distance; or as a distraction from the main business of academic planning; or as a battleground for the conflicts of university politics, self-interest, and baseness; or as a prerogative of administrators with which scholars ought not to be concerned. Such views of the budgetary process are destructive of the wholeness of the university and of responsible planning for the utilization of university resources. Budgeting should never be allowed to become an educational bottleneck; it must always be conducted in a manner which makes it an instrument for the achievement of educational purposes. The budget should be viewed as a scheme for allocating scarce resources for the support of programs, under the guidance of explicitly formulated judgments of value. The budget is simply an expression of educational planning in monetary terms.

The budget is a planning device, a control device, and an accounting device. The budget is a plan for the support of operations over a specified time-period. It is also a tool for controlling operations in accordance with an accepted plan and for reporting the extent to which the intended allocation of resources has been achieved.

In order to perform such functions, the budget should:

1. Comprehensively identify all the operations in which the university engages and the amounts of resources consumed by these operations.

2. Expose the trade-offs which are being made in the allocation of resources for the support of alternative programs.

3. Identify the considerations which enter into decisions regarding resource allocation.

4. Facilitate control of the use of resources by the administrative system of the university.

The typical structure of university budgets suggests that the primary function of the budget is generally thought to be that of facilitating expenditure control. The typical budget is organized on a departmental basis reflecting the administrative organization of the university, and identifies appropriations by object of expenditure so as to specify the nature and amounts of resources (personnel, supplies, equipment, etc.) which are intended to be purchased for the support of departmental activities. A departmental format for presentation of a budget may be functional, and even indispensable, for the functioning of the budget as an instrument of expenditure control, but it is not functional for identifying, either for the department or for the institution as a whole, the nature and amounts of resources which are being consumed by the respective activities and programs of the institution. Indeed, no single budgetary organization is adequate for a multi-purpose budget system. Both a departmental format and a program format are required and there is need for a "crosswalk" between these two forms of organization. It is only through such flexibility in the structure of the budget that budgeting can be not only a control device but also a planning device. One of the causes of the sluggishness of higher education in implementing the new budgetary technology has been the inability of colleges and universities to revise their accounting structures to provide for this necessary flexibility.

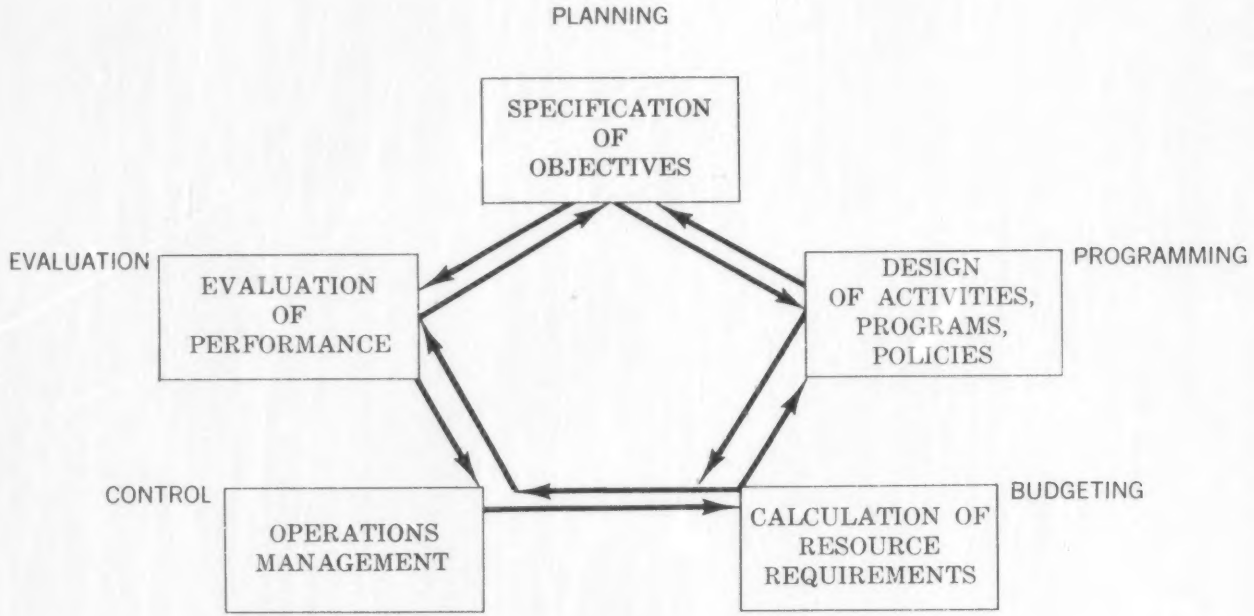
Budgeting must be viewed as a phase of program planning within a total system of purposive activity. The budget is simply a tool of such planning and of control of operations in accordance with an accepted plan. Simply stated, a systems approach to budgeting involves the creation of procedures for budgetary planning which facilitate these functions of program planning and program control.

Systematic Program Planning in the University

University program planning must make provision for each of the following functions: to formulate objectives, identify programming and financing constraints, describe alternative programs as means for achieving objectives, evaluate costs and benefits of alternative programs, select the optimal set of alternatives for university operations, specify steps for implementing and controlling programs, and evaluate performance. The activity of planning is cyclical, as Figure 1 suggests. It is important to recognize the significance of

Figure 1

THE ACADEMIC PLANNING CYCLE



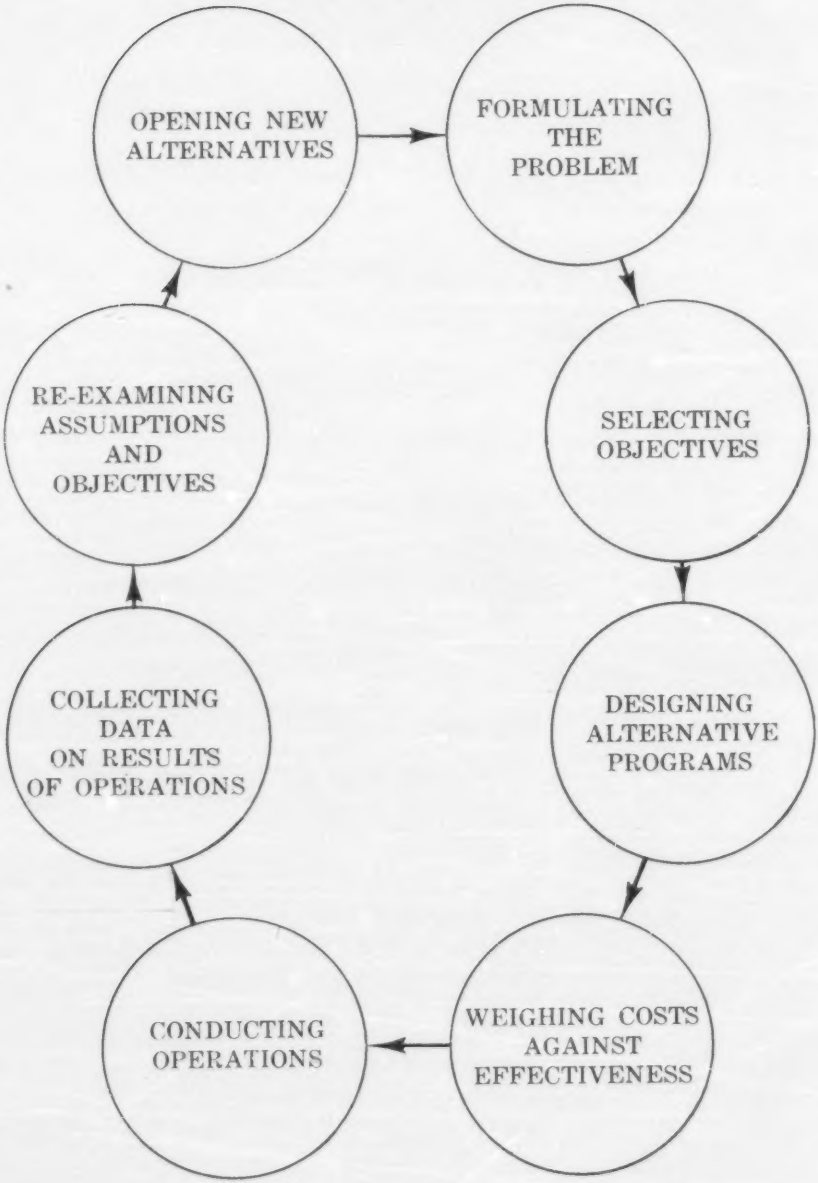
feedback flows in this diagram. The programming phase may lead to modification of the formulation of objectives and may influence the ranking of objectives in an order of priority. Similarly, the budgeting phase may require a modification of programs. There may be need for revision of the budget as operations are carried out. And performance evaluation may be applied directly to the revision of operations as well as to the revision of objectives in the next planning cycle.

Institutional planning involves **projection,** the estimation of the probable outcomes of a given course of action; **control,** action designed to guarantee that the intended course of action is actually followed; and **evaluation,** the determination of the extent to which expectations have been fulfilled. The crucial decisions in the planning process have to do with the assignment of priorities to objectives and programs, the choice of alternative means for realizing determined objectives, and the calculation of the resources which must be allocated to meet program costs. The stages of analysis which support the planning process are illustrated in Figure 2.

Basic to the implementation of a systems approach to university budgeting is a methodology for specifying the objectives in terms of which the productivity of university operations will be measured. The main components of the university's mission must be explicitly identified by program in a fashion which permits decision-makers to reach judgments concerning the rank-order of importance among program objectives, to establish a purposive plan for the control of operations, and to assign relative priorities to programs which make competing claims upon limited resources.

Both primary and support objectives must be specified in the planning stage of the planning-programming-budgeting-evaluating cycle. The distinction between primary and support objectives is important as a perennial reminder of the hierarchy of program objectives and of the need for designing and evaluating support functions (like administration and plant operation) in the context of their contribution to the realization of the primary functions of the university (like instruction and research). But the distinction is also important as a reminder of the need for specific, purposive planning for the conduct of support programs. In any productive system a major expenditure of funds will be required to sustain activities which, while not contributing directly to the attainment of basic production objectives, are essential to the maintenance of the system itself. The specification of support objectives will facilitate an appraisal of the

Figure 2
THE STAGES OF ANALYSIS



utility of these activities, too, as means for realizing intended objectives.

The specification of educational objectives in operational terms involves definition of a set of criteria by which the effectiveness of educational programs may be measured. At the present time only crude and incomplete measures exist; nor is there convincing evidence that educational research is about to achieve a major breakthrough in the refinement of these criteria or in the formulation of new ones. Systems analysts working in education are distressed over the inadequacy of their present tools for measuring the output of educational systems in qualitative terms and are apologetic about the quantitative criteria on which their analyses tend to focus. Such analyses tend to be computer-dependent and it is easier, of course, for a computer to process data concerning educational output measured in units of education earned (e.g., credits, courses, years of schooling, or degrees) or numbers of full-time-equivalent students served in any given term, than to report such educational progress as a classroom teacher is able to measure through an essay examination. Nevertheless, even with this limitation systems analysis, as aimed at the limited objective of optimization of resource utilization within the range of certain quantifiable measures of educational development, may make an important contribution to the improvement of the quality of education by helping planners to identify and treat certain kinds of factors which, in any event, must be considered in decision-making. Even if it is confined to the use of imperfect quantitative measures of educational achievement, systems analysis can help decision-makers to obtain satisfactory answers to at least one kind of question bearing on resource allocation, so that they can then bring their best pedagogical judgment to bear on other kinds of questions which at present resist systematic analysis.

Once the specification of objectives has been accomplished, the planning unit must be asked to describe a set of activities through which each of its intended objectives will be achieved. The creation of a methodology for obtaining a comprehensive and rigorous review of alternative sets of activities as means for achieving specified ends is at the heart of implementation of an integrated system of planning, programming, and budgeting.

Recent discussions of program budgeting have been greatly hampered by confusion over the meaning of the term "program." In this discussion the term "activity" is understood to mean a series of efforts of a specificable type, which are exerted by an organizational

unit in an attempt to realize an objective or set of objectives. A "program" is a group of interdependent, coordinated activities which mutually contribute to the realization of a common objective or set of objectives. Thus activities are atomic units of institutional operation, programs are molecular units. Such definitions, of course, are abstract and subject to misunderstandings which distract from consideration of the essential principles of program budgeting. For further clarification Figure 3 offers an extensional definition of "program," a list of sets of activities which may be labelled university "programs."

Figure 3
TAXONOMY OF UNIVERSITY PROGRAMS

I. INSTRUCTION
- A. Organized Teaching of Degree-Credit Courses*
  1. General Studies
  2. Technical
  3. Baccalaureate General
  4. Baccalaureate Professional
  5. Graduate Professional
  6. Masters
  7. Doctoral
- B. Non-Degree Instruction
  1. Remedial Instructional Services
  2. Other Non-Credit Instruction

II. RESEARCH, DEVELOPMENT, AND CREATIVE ACTIVITY*
- A. Research
  1. Basic Research
  2. Applied Research
- B. Development
- C. Creative Activity in Art and Scholarship

III. PUBLIC SERVICE
- A. Cultural and Entertainment Services
- B. Institutes, Conferences, and Continuing Education
- C. Cooperative Extension Services
- D. Broadcast and Public Information Services
- E. University Press

*Classified by subject fields following HEGIS Taxonomy of Instructional Programs in Higher Education.

IV. INSTRUCTIONAL SUPPORT SERVICES
- A. Library Services
- B. Audio-Visual Aids for Classroom Instruction
- C. Programmed Learning and Language Laboratory Services
- D. Computer Services for Instruction and Research
- E. Museum Services
- F. In-House Instructional Radio and Television Services

V. OPERATIONS AND MAINTENANCE SERVICES
- A. Care and Cleaning of Grounds, Walks, Streets
- B. Routine Care and Cleaning of Buildings
- C. Repair, Renovation, and Improvement of Buildings
- D. Provision of Utilities
- E. Protection of Plant and Persons
- F. Transportation and Motor Vehicle Services
- G. Care and Maintenance of Equipment

VI. STUDENT SERVICES
- A. Student-Body Maintenance Services
  1. Recruitment of Students
  2. Admission of Students
  3. Maintenance of Student Academic Records
- B. Aids to Student Planning
  1. Academic Counseling
  2. Non-Academic Counseling
  3. Foreign Student Counseling
  4. Placement Services
  5. Student Financial Aid
- C. Aids to Student Living Environment
  1. Housing Services
  2. Food Services
  3. Health Services
- D. Student Activities Services

VII. GENERAL ADMINISTRATION
- A. Program Planning and Development
- B. Financial Planning and Budgeting
- C. Fiscal Management and Control
- D. Capital Improvements Planning
- E. Space Assignment and Scheduling
- F. Institutional Research
- G. Administrative Data Processing
- H. Purchasing and Property Control
- I. Fund-Raising and Income Procurement

VIII. PERSONNEL SERVICES
- A. Hiring and Advancement of Faculty and Staff
- B. Faculty and Staff Personnel Benefits and Services
- C. Faculty and Staff Training and Development
- D. Faculty and Staff Food and Housing Services

IX. GENERAL INSTITUTIONAL SERVICES

- A. Purchasing Services
- B. Communication Services
  1. Telephone Services
  2. Mailing Services
  3. Information Services
  4. Publication and Printing Services
- C. Parking
- D. Insurance Services
- E. Bookstore Services

The taxonomy of Figure 3 may be viewed as an attempt to define the scope of the university system with which budgetary planning must systematically deal.

A systems approach to program planning involves the promulgation of specific plans for the conduct of all programs comprising the university system and integration of all the sub-system plans into a single plan of operations which can be supported with the available resources and will make optimal use of the available resources. The budget is one of the products of this process of systematic program planning and hence must be of direct concern to those who are charged with the responsibility of designing and conducting the activities of the institution.

Program Planning and Budgeting

If budgeting is to follow from program planning, as our interpretation of the planning cycle suggests, the manner in which program planning is conducted is the crucial consideration in the entire process. An important step in implementing a systems approach to university budgeting is the design of a format for program planning which provides for the integration of planning, programming, and budgeting, and actual use of this format in program planning. Program planning in some form or another occurs at every university. The form and quality of this program planning are what is distinctive in a systems approach to university administration.

The format for program planning should require each program plan to include the following elements:

1. Statement of the need or demand which the program is intended to meet.

2. Specification of the objectives which the program is intended to achieve.

3. Description of the activities by which the intended objectives will be pursued.

4. Description of alternative sets of activities which might be considered as possible means for realizing the intended objectives and evaluation of the comparative effectiveness of these alternative programs for realizing the objectives.

5. Calculation of the resource requirements of each alternative program, projected over a five-year period.

6. Comparison of the cost-benefit efficiency of the alternative programs, combining considerations of effectiveness in the realization of objectives and efficiency in the utilization of resources.

7. Specification of the criteria by which the program will be evaluated and a methodology for conducting program evaluation.

It is particularly important to insist on the indispensability of Step 5 in the above format. The calculation of the resource requirements of programs is the systematic basis for program budgeting. Systems analysis is essential to this calculation. Each program for which resources are committed in the budget must be analyzed as an input-transformation-output system, to determine what resources must be put into the system in order to obtain the desired output. The name of the game is to optimize the benefit, measured in terms of program objectives, which is obtained from a given commitment of resources.

Systems analysis as applied to budgetary planning for an isolated program is in itself a complicated and difficult kind of research. After an initial period of excessive enthusiasm and overstatement for the utility of cost-benefit analysis as the basis of institutional budgeting, we have entered a period of deep skepticism concerning both the possibility and the desirability of the kind of program planning recommended in the foregoing. Such doubts are especially widespread concerning the applicability of a systems approach to program planning at the institutional level, where the task of programming is rendered many times more complicated by the necessity of prioritizing a multiplicity of programs in relation to a concept of institutional mis-

sion. That the task of systems analysis in relation to institutional budgeting is complicated and difficult is undeniable. The conclusion that it is impossible to perform this task, however, is warranted only after specific and persistent efforts to conduct such analysis have proved unsuccessful.

Exaggerated claims about the utility of systems analysis must, of course, be avoided. Misunderstanding about what systems analysis can accomplish in university budgeting has led some potential users to discard it prematurely. The utility of systems analysis in university program planning and budgeting is limited by the complexity of the educational environment, by the uncertainty which all futuristic planning inevitably encounters, by the unavailability of a comprehensive and functional criterion of educational productivity, by the difficulty of articulating criteria of efficiency which are applicable in education, and by the difficulty of collecting and maintaining accurate data regarding educational operations. Despite such limitations, systems analysis, while no panacea, is an important step in the direction of improved planning and management in education. A university which installs a systems approach to budgeting cautiously, deliberately, and with careful recognition of its limitations will find in it all it professes to be, viz., an important tool for better planning and decision-making.

A systems approach to university budgeting is characterized by recognition that analytical information regarding the resource requirements of programs is relevant to decisions regarding resource allocations, and by the mobilization of systematic efforts to obtain such information and apply it in the budgeting process. But there has been a strong demurrer in university circles. It has been said that such efforts to gather information about institutional operations are misplaced and that they invite a misuse of such information by persons who do not understand or value academic freedom. It has been argued, somewhat more plausibly, that the big issues confronting university decision-makers are not significantly illuminated by cost-benefit analysis and that it is wasteful to routinely require program justifications, whether for new programs or for continuing programs, in the kind of format suggested by systems theory. It is argued that cost/benefit analysis is less useful where great uncertainty exists and that in educational planning projections for more than a year or two ahead are almost worthless. And it is held that where, as in education, objectives are difficult to express in quantitative terms, cost/benefit analysis does more harm than good by creat-

ing the impression that quantitative criteria of effectiveness are determinative.

Such criticisms of a systems approach to university budgeting are anything but trivial, and they will be found especially edifying by those whose enthusiasm for arithmetic approaches to planning tends to invite oversimplification of the processes of education. But such criticisms do not gainsay the essential principle of systems theory as applied to program planning, viz. that analytical information regarding the consumption of resources by programs is relevant to budgetary decision-making and that every effort must be exerted to obtain and apply such information rigorously, comprehensively, and systematically.

In the university, as in most other systems, the available means are not equal to all legitimate or worthwhile desires. The task of university planners is to allocate the available means in a manner which maximizes the efficient utilization of resources for achieving institutional objectives. It is not enough to require that every expenditure item in the budget be worth its cost. It is necessary to view both the worth and the cost of each item in comparison to other possible expenditures. An ideal budget is one which produces more valuable results, as measured by the mission of the institution, than would be achieved if the money were spent in some other way. The evaluation of budgetary allocations, then, should proceed by way of an attempt to determine not whether each expenditure will procure goods or services that are worth the expenditure in an absolute sense, but whether the expenditures will bring about results which are more valuable than could be obtained from alternative uses of funds. Obviously, it is only through study of the university system as a whole that such a determination can be made.

The difficulty of mobilizing such an analysis in a multi-purpose and complex university is not to be discounted. Different departments of the university tend, quite naturally, to view the value of the goods and services procured under their respective departmental budgets in absolute terms and claim, quite sincerely, that they are incompetent to judge the value of these goods and services in relation to those which might be procured by an alternative allocation of funds to some other department. The approach to budgeting which emerges from systems theory presupposes that the value of results obtained from alternative allocation of resources to programs can be compared, but such comparison assumes that there is some common, ultimate

objective by which different activities and programs may be judged. However, the commonness of objectives among operating units of the university is frequently obscured by parochial interests. Even a president's office displays its share of parochialism and is in this respect like other departments of the university. The result is that in most universities the staff tend to think of the budget as representing value preferences from among unlike (and competing) ends, and they see no common or rational basis for assessing the value of the different activities which the budget is directed to support. The budget is viewed simply as the resultant of conflicting forces and interests within the institution.

By contrast, a systems approach to university budgeting calls for identification of the common purposes by reference to which the utility and value of different activities may be evaluated. A systems approach requires that decisions regarding specific items in an expenditure budget should be reached contextually, through a comparison of the relative utility of alternative expenditure patterns. It is towards this goal that budgetary planning should move.

Modelling and Formula Budgeting

The theory of program budgeting recognizes that an institution such as a university is characterized by a complexity which defies quantitative analysis. Even with the aid of computerized programs for processing vast quantities of data, the theory admits that the complexity of the university system will not be fully reflected in any information system which describes and analyzes university operations. Computer programs at best involve use of a series of categories defined with a degree of arbitrariness, with a resulting distortion of the reality which the processing programs seek to classify. Systems theory is aware of the limitations of even the most comprehensive form of operations analysis and warns against the use of systems analysis without proper regard for these limitations.

Practically speaking, however, educational decision-makers require tools which will enable them to apply analytical information about institutional operations in reaching budgetary decisions. The human mind is a powerful instrument of interpretation and evaluation, but it, too, has its limitations. The best mind cannot retain all the information which is relevant to decisions as complex as determination of a university budget. Computerized simulation models of the university and budgetary formulae are mnemonic devices which can

be of great assistance to university planners in managing the complex array of information which bears on budgetary decision-making.

Simulation models and budgetary formulae are useful only to the extent that they are reasonably realistic for the particular institution in which they are employed. A budgetary formula which is functional in one university is not necessarily functional for another, and an expenditure model which is used for calculating average resource requirements for programs in a state-wide system of universities is not necessarily useful for calculating resource requirements of programs within any particular institution within the system. However, it is a prolonged and expensive process for a university to develop its own computer programs for simulation purposes, and it is usually preferable, from a cost/benefit standpoint, for a university to install one of the software packages which have been recently developed for cost/benefit analysis and simulation by such organizations as the National Center for Higher Education Management Studies (the Resource Requirements Prediction Model) or Systems Research Group (the CAMPUS model). Fortunately, several of these externally developed models are sufficiently flexible to allow reasonable adaptation to the particular circumstances of most universities.

Formulae expressing a relationship between input and output (e.g., faculty/student ratio, mean faculty compensation by rank, custodial costs per square foot) are useful in the preliminary stages of budgetary planning, particularly if the formulae are induced from analysis of operations in the institution in which the formulae are used. Such formulae are ordinarily derived as statistical averages and hence should be applied only in the context within which the averages are valid. For example, a student/faculty ratio derived as an average for the university system as a whole should not be applied as a norm for operations of a single department (sub-system) within the university. Failure to observe this elementary rule of statistics leads to misuse of budgetary formulae and to an unwarranted discrediting of formula budgeting itself. Within limits, however, budgetary formulae will be found useful as postulating preliminary hypotheses for resource allocation, divergence from which would need to be justified by specification of the distinctive circumstances or extraordinary benefits which make the ordinary formula inapplicable.

Formula budgeting is an adumbrated form of systems analysis as applied to budgetary planning. Irresponsible use of budgetary formulae can lead, of course, to gross oversimplification of the opera-

tion of the university system and to serious mistakes in the allocation of resources. Formulae and their application must be reviewed continually to assure that formulae are employed only as means to accomplish a rationally justified allocation of resources, based on systems analysis, and that they do not become ends in themselves. When kept within the limits of their statistical validity, however, budgetary formulae are likely to be found extremely useful for establishing a focal point for budgetary debate, for exposing trade-offs in the support of programs, and for achieving an intended distribution of resources in a complex institution.

Steps in Implementing a Systems Approach to University Budgeting

The crucial problem in actually implementing a systems approach to university budgeting is installation of the information base for analysis and evaluation of the resource-effectiveness of programs. The flow of information and data transformation required for an Educational Resource Management System is graphically depicted in Figure 4. Each stage of the planning-programming-budgeting-evaluating cycle requires the input of information which is transformed through analytical processes to generate new documents as output. The documents generated through these stages in the planning cycle then become the basis for decision-making and, if implemented, guides for university operations. Provision for the flow of information in forms and at times required by the processes of planning and decision-making is crucial to effective implementation of a systems approach to budget.

The form of the information system is, of course, determined by the information requirements of planners and by the program classification structure of the university. Following specification of the information requirements of systems analysis, a data element dictionary must be defined, identifying the kinds of data which must be collected as input to the information system. Creation of procedures for collecting and maintaining these data and design and installation of computerized processing programs based on a model of operations will then make operational an information system which will sustain both historical analyses and simulative forecasts of resource utilization patterns. Steps will also have to be taken to simplify and interpret the great volume of information which will be generated by such a system, so that administrative personnel will be able to employ the results of such analyses in decision-making.

The form of the information system carries direct implications for the structure of the accounting system. An accounting system must be viewed as a means for distributing information concerning the utilization of resources by the activities of an enterprise. Hence the categories of the accounting system must be compatible with those of the total information system and, in turn, with the program classification structure under which activities are classified. The accounting system must be designed so as to permit a crossover between the program budget, which is especially relevant to the processes of resource planning, and the departmental budget, which is especially relevant to the processes of expenditure control.

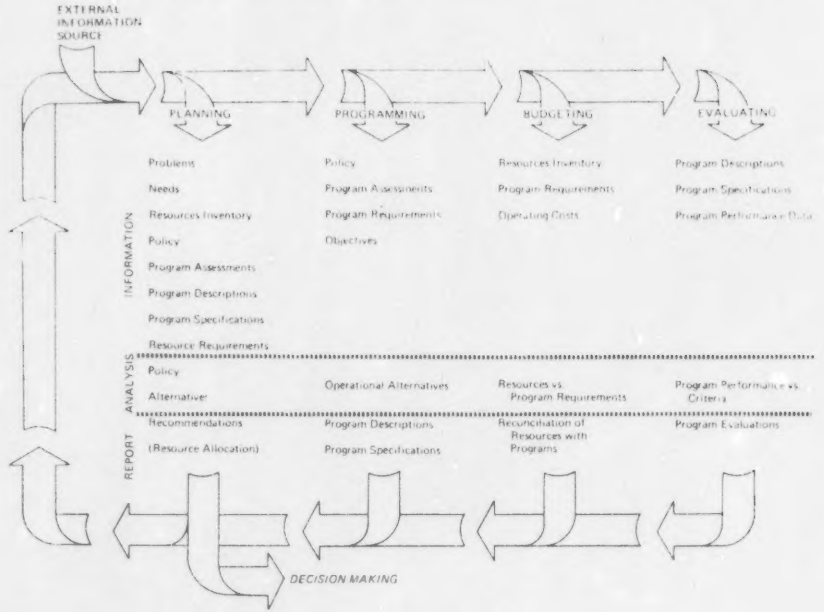
University accounting systems have not always kept pace with the changing information requirements of university administration. The situation is often complicated, in a state university, by statutory or executive controls over the institutional accounting system by state agencies which have little understanding of the processes of fiscal management within universities. Indeed, the accounting system seems often to have been designed for the sake of clerical expediency rather than for the sake of providing information for analysts and planners. An important step in implementing a systems approach to university budgeting, therefore, is review of the appropriateness of the accounting structure and modification of the structure, where necessary, to adequately serve the information requirements of systems analysis.

Delegation of responsibility for specific plans of the planning-programming-budgeting-evaluating cycle is another crucial step in implementation of a systems approach to university budgeting. In most universities some realignment of administrative staff will be entailed to provide the manpower needed for systematic resource planning, but in most instances this manpower can be provided through reorganization without increasing the total administrative staff. A variety of organizational forms can be employed to accomplish the intended result. Some universities will favor a more centralized organization, others a more decentralized organization; each form has both advantages and disadvantages by comparison to the other. The important thing is delegation to specific individuals of responsibility for each of the important functions which belong to a systems approach to budgeting.

Figure 5 is an attempt to summarize the steps that are necessary for implementation of a systems approach to university budgeting.

Figure 4

INFORMATION FLOW AND DATA TRANSFER IN THE PROCESSES OF EDUCATIONAL RESOURCES MANAGEMENT SYSTEMS*

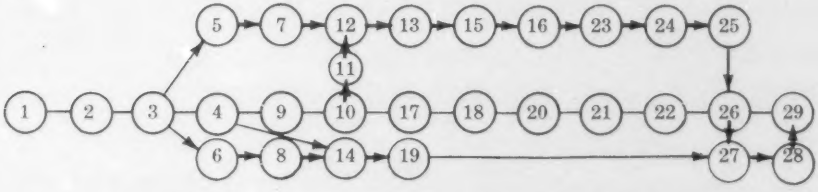


*From Dr. William H. Curtis, **Educational Resources Management System,** published by the Research Corporation of the Association of School Business Officials, 1971. Used by permission.

The graphic portrayal of these steps is designed to establish a point of departure for those who might wish to employ a Program Evaluation and Review Technique in implementing a systematic budgeting program. The flow graph is probably defective in its display of the inter-relationships among particular steps in the implementation process. Furthermore, the sequence of steps might well vary substantially from that suggested in the flow graph. But the flow graph should be useful as a summary of the steps which must be taken to move from talking about program budgeting to doing something about it.

Figure 5

FLOW GRAPH OF STEPS FOR IMPLEMENTATION OF A SYSTEMS APPROACH TO UNIVERSITY BUDGETING



Identification of Steps in Flow Graph of Implementation of A Systems Approach to University Budgeting

Event Number	Title
1.	Start implementation of systems approach to university budgeting
2.	Design staff organization for performing functions of planning-programming-budgeting-evaluation
3.	Delegate responsibility for functions identified in (2)
4.	Design format for presentation of program plans
5.	Start installation of information system for operations analysis
6.	Start in-service training program for staff on systems approach to planning, programming, and budgeting
7.	Specify information requirements for analysis of university as a system
8.	Conduct training program on procedures for specifying program objectives
9.	Define categories for classifying university programs
10.	Design formats for presentation of expenditure budgets on a) programmatic and b) departmental basis (with cross-over procedures)
11.	Review existing structure of accounting system and modify as needed
12.	Design form of information system

13. Define data element dictionary
14. Conduct training program on use of format for program planning
15. Delegate responsibility for data collection and maintenance
16. Design model for simulation of university
17. Design formats for presentation of multi-year operating budgets
18. Design formats for presentation of capital improvements plans
19. Conduct training program on procedures for long-range planning
20. Design formats and procedures for evaluating the effectiveness of programs
21. Design model of cost/benefit analysis
22. Create data processing programs for cost/benefit analysis
23. Create data processing programs for simulation model
24. Conduct simulation and cost/benefit analysis for base year.
25. Complete installation of information system for operations analysis
26. Simplify information system output for use by staff
27. Conduct training program on use of simulation and cost/benefit models
28. Complete in-service training program for staff on systems approach to planning, programming, and budgeting
29. Complete implementation of systems approach to university budgeting

Budgeting and the Humanization of Learning

Some critics of a systems approach to university budgeting warn that implementation of such an approach poses a serious threat to the humanistic quality of higher education. How the unsystematic and subjective approach to budgeting which now characterizes most American universities can be more humanizing is difficult to conceive. The planning process in most universities is ad hoc rather than comprehensive, responsive rather than anticipatory, decentralized and fragmented rather than cohesive and integrated. Decisions on the allocation of scarce resources are frequently made without the benefit of accurate information and rigorous analysis of the way in which the allocated resources are being used for achieving institutional purposes. There is scarcely any serious attempt at long-range planning, and even capital improvements projects are undertaken with little reliable information on long-range program trends. Responsibilities for institutional planning and budgeting are often poorly defined, and the process of budget-building is often conducted under the stress of time schedules which make careful analysis impossible. Coordination of the various planning and decision-making sectors of the university is often non-existent.

Were it not for the personal gifts of key administrators who manage to obtain acceptable results in spite of the system, the situation would be intolerable. But clearly, the present procedures for reaching resource allocation decisions are not the cause of humaneness in higher education. On the contrary, the existing system is one of the obstacles in the way to controlling the processes of the university for maximum service to human ends.

A better system for obtaining control of the operations of the university should serve to make the university as an institution more responsive, under humane educational leadership, to the needs of human beings. Obviously, no technology, much less the technology of financial management, is in itself a guarantee of human freedom; but neither is technology in itself an enemy of freedom. The effect of technological advance is always to test the ability of human beings to employ a new contrivance to enhance the quality of life. This, too, is the effect of the new application of management science in education. With humane educational leaders, who have developed skill in the employment of the new technology, the "managerial revolution" in higher education should only lead to a greater responsiveness of the university to the requirements of mankind.

STRATEGIES FOR CHANGE IN UNIVERSITY SYSTEMS

John W. Snyder

For use in this chapter, change is defined as purposive intervention into articulated congeries of dynamic university systems, in order to achieve appropriate outcomes in the future about which there is sufficient agreement to enable development of both financial resources and significant participation. Strategy for such change must successfully respond to the need for resources, advocacy, goal-setting and consensus about those goals. A possible method for implementing such a strategy is an iterative device of providing repeated comment and input from all segments of the enterprise affected by any proposed change. Such an iterative device must take into account both the holistic and the systemic nature of effective change.

The Dynamics of Change

Few topics have enjoyed greater discussion in recent years than the matter of beneficial change and how it is to be produced within higher educational institutions. J. B. Lon Hefferlin's **Dynamics of Academic Reform** sought to isolate various aspects of change and to determine the causes and conditions which had shaped their course as of the time of its publication in 1969.* Since that time at least two additional items of significance have entered the discussion. First, there has been a certain degree of frustration on the part of external agents at having failed to achieve much lasting reform without becoming involved in permanent operational funding reform. Secondly, the Carnegie Commission has suggested that institutions devote somewhere between one and three per cent of their annual budgets to renewal, its definition and efficacy necessarily to be judged by the individual institutions and their many constituencies. Such concerns notwithstanding, availability of resources as the greatest single factor in effecting change has grown no less important. This is true even though it might be appropriate to observe, in sympathy with Carnegie and a number of other foundations, that external funding can purchase change as an addition to programs. Substitutional change must be internally generated in all save the most autocratic or oligarchial institutions.

*Published by Jossey-Bass, hereinafter cited as **Dynamics**. A partial listing of the changes reported occurs below, pp. 62f.

Problems abound and offer at times a difficult context within which to view change. While some among the myriad constituencies which make up a university insist that present problems of budget, enrollment, student dissatisfaction and faculty restiveness are reason for reform, others question the need for any **more** change at all. Faculty conservatism is often cited as the reason for such questioning, but if so its impact is probably greater on changes in teaching than on changes in the state of the disciplinary art, where faculty are adjudged by their peers to be at the forefront of development. Constrained by budgets and conflicting pressures, administrations as well are inclined to seek preservation of the **status quo,** largely because any shift in emphasis is likely to have an outright cost in systems which find it difficult to drop anything, save by atrophy. The public, longing to return to the gentle campuses of distorted memory, is perhaps most conservative of all, through its elected representatives, when demanding relative reductions in funding for higher education. Students, too, can be suspicious of new ideas, however many may need and some may be able to articulate the desire for teaching of greater immediacy and applicability to their desires for personal, vocational and social practicality. Thus, innovators have occasionally found their expensively prepared efforts quietly ignored by the large numbers of students needed to keep a new course going. Everyone finds change threatening, and more than one person has found his ability to live with it aided by the effort to get out in front of it perhaps, but not necessarily, to lead.

Since such resistance rarely occurs in a vacuum, reference to it points up the importance of recognizing that strategies for change in university systems must be discussed in a context of immense ongoing change. If the mere development of new courses through new information and changeover of personnel is the criterion, **Dynamics** (p. 54) finds that the rate of change for such developments is 4.4% in normal operation. Current estimates of faculty turnover in a steady state at some of the largest institutions might raise that rate to about 5%.*

Many items of change resulting from these rates of turnover are listed in **Dynamics** (pp. 61ff.), and now the list can be expanded to some extent. Variation in courses has already been mentioned, influenced by changes in the state-of-the-art but also by student need

*The University of California **Annual Report of Personnel Programs,** 1973, p. 13, shows 4.1% as the current rate of regular faculty turnover, with 10.4% as the average for the past twelve years.

and demand. Standardization of specific curricula continues to move along as national meetings and other means of communication distribute information about innovative programs and new fields. A matter of frequent complaint, or of pride, depending upon the informant, is the drift toward abstraction after the development of any new curricular thrust. Social problems recently discovered become analyzed and abstracted away from the real people they initially involved; science research becomes even more basic as its publication moves upward to more prestigious journals; engineers become physicists, physicists drift toward theoretical inquiries; theory becomes pure mathematics. The process goes on continually, as it has since Aristotle first put forward the notion that information can best be understood if divided into logical categories. This drift towards abstraction has a pedagogical cost in the separation of categories, even while it acquires the strength of penetrating analysis without distraction. So we teach more and more about expanding but increasingly divergent areas, relying upon the student to establish relationships between things he is taught in isolated pockets. At least partially in reaction to this phenomenon has come a revival of interest in interdisciplinary studies for the benefit of students who are themselves divided on the value of abstraction.

Vocational emphases seem increasingly popular with some students who appear to be drifting away from an older belief in the liberalizing possibilities of education. They move towards the social sciences and biology in such droves that the predictions of market-glutting made for engineers a year or so ago, and possibly still valid for education majors, now are being made for the behavioral and biological sciences. Particularly in connection with the last fields, divisions and combinations alike appear: biology may divide into ecology and molecular biology or all the sub-fields may combine (often to the detriment of certain categories) into the broad field of the biological sciences. Hyphenated interests may move from interdisciplinary studies to become new departments in time. Bio-chemistry perhaps led in this, but bio-physics and a variety of engineering applications to biological and behavioral phenomena may come along in time, following breakthroughs in information. What some are likely to view as administrative initiatives also are changing; campuses expanding into non-traditional studies, general education requirements moving from former standardization to a considerable degree of latitude, undergraduate major specifications going up in the number of hours demanded but down in specific course requirements.

Change is perhaps even more obvious outside of curricular mat-

ters. Students, becoming active and effective in local politics as they acquire the vote at an earlier age, appear also to have adopted the external badges of Consciousness III.* Indeed, it almost seems safe to say that of all change agents, Consciousness III at least superficially is far ahead of the field and by no means confined to the student body.

Among the changes through which we are going, some are far less susceptible to control than others. Every institution concerned about its enrollment puzzles over the fiscal winds of taxation, inflation, boom and recession and over their effects not only upon attendance but also upon attitudes. The currents of demographic shift, of social and technical concern and development, and the accidents of geography condition our affairs in ways about which we can only give educated guesses. But there is a difference between these things and the more immediately susceptible items of how we condition (or ignore) students' expectations and the availability of the courses and services they need.

The Context of Change

Strategies for deliberate change must take shape within a context of continual change, buffeted by plurality of views within and without; they must project operation at a time future to the period of designing them; they will be conditioned by changes in society, politics, demography, economy, and will be shaped by geography, legislative districts, industrial patterns and attitudes of the Federal Government, among other things.

An accounting of resources as the first step in devising strategy has Biblical roots. External funding agencies now show some preference for developing strategies for change rather than buying change in packages put up by campus faculty or administrative entrepeneurs. The Carnegie Commission's series of studies of the problems of higher education currently is under criticism for having concentrated upon measuring the form but ignoring the substance of education. As noted earlier, this combination has led to the suggestion that real and permanently changing change can come only if the institutions themselves will devote a small portion of their annual budgets to renewal. With funds thus freed, any campus could turn to the problems of creating its own definitions of needs and designing entities for meeting those needs.

---

*As described by Charles A. Reich, **The Greening of America**, Chapter IX.

Purposeful change does not occur apart from advocacy. That advocacy may come from within or from without, but even in the latter case it must have the ability to strike responsive chords within the institution in order to move past the stage of idle conversation. Whether it be a new medical program, research along some new line or teaching innovation, strong faculty advocacy is probably the single most important factor, after resources, in enabling change. And such faculty advocacy at the present time must itself be based on a tenured position and a moderately secure reputation if the advocate is not to undertake undue risk in attempting a new venture. This appears to be the case in all areas of possible change except new research directions, and then only with more than just vague promise of outside funding. The concern behind this observation stems from witnessing many an aggressive young instructor blunted in his or her enthusiasm because the department made known its views about the hazards of interdisciplinary efforts or some other innovation. Some entrepeneurs have responded to this circumstance by being able to create their own new departments in order to pursue their goals, but tight budgets are rapidly shrinking that avenue. Administrative and student advocacy are also important, and few changes persevere which lack either of these, although there is the suspicion that reforms can be started on faculty advocacy alone far better than on administrative or student initiative alone.

External money has in the past found it relatively easy to make the persuasions, but difficult withal to purchase permanent change in the operation of a large institution. Examples abound of external advocacy but a few that might be mentioned could include statewide language training programs in which the university took the lead with outside funding to upgrade language training all the way from secondary schools to college level programs. In such efforts the impact lasts about as long as the money, although residual effects in having provided a standard by which competency in language can be imparted and measured could be called long-term through questionably permanent effects. Otherwise some of the most important aspects of the project, such as overseas experience for students, tend to find no sympathy with state legislators once the extramural funding has vanished.

To be sure, such external funding also relies upon internal advocacy and many changes thus begun have persisted. For example, language laboratories, initially funded from external sources, became under a determined faculty such an important item in instruction

that they managed to be picked up on hard money after the soft disappeared. It can also be pointed out that many such changes endured until the person who was the driving force left the institution.

In any case, whatever the source of the idea for change, it also requires considerable vision with respect to new ways to do old things, new combinations of old ideas or (rarely) entirely new ventures. One of the most serious problems in dealing with campus change is the fact that, among faculties struggling for eminence in particular disciplines, few persons are aware of the trends and currents in modern educational change and the growing literature on these matters. Where once it may have been fashionable for subject-matter people to score methodology, in recent years this has come to be questioned. The educational scene now exhibits concern over methods of communication, varying abilities of students to receive information, the value of strategies for total learning rather than just cognitive reliance, ability assessment for students from disadvantaged backgrounds with norms other than the usual range of scores on aptitude tests, needs for and designs of enrichment or remedial programs, and the charming notion that learning may be an ecstatic experience. These seem to suggest that even the most capable faculty member could find something with which to achieve his own ends more satisfactorily if he would but think through this literature enough to sift the applicable from the inapplicable in his own case.

The literature on teaching, learning and student development shows that much of what is taught by conventional methods produces outcomes the instructor had not intended in the lives and development of his students. But, furthermore, little insight is needed to observe that students' present courtesy makes no attempt to disguise continued dissatisfaction with their academic experience. This observation must immediately be qualified by pointing out that not all students are even potentially so alienated, but it may be true that the most disenchanted are those with the greatest potential for genuine leadership in the apparently stormy years lying ahead.

Perhaps the basic necessity with regard to planning for change is the matter of purpose, not only the purposes of the proposed change itself, but also how change relates to the goals and purposes of the institution within which it is supposed to occur.

One of the most striking aspects of current discussion about the purposes, plans, priorities or new directions is its difficulty with re-

gard to the task of stating the goals of higher education. Efforts by traditionalists or moderates to do so seem to come up with, usually, less felicitous rephrasing of Alfred North Whitehead's views. All sound very much like platitudinous affirmation of flag and motherhood. One is tempted to suggest that a reason for this is that the goals of higher education for a significant section of its population have not changed at all from Whitehead's formulation of them, and we'd all be better off if they were simply adopted without further comment. The problem is that this still would represent only a section of the populations with whom we must deal.

Another striking aspect of discussion concerning goals is the degree to which most formulations which are not warmed-over-Whitehead are merely reactive to the shifting set of problems most institutions face. Such reactive purposing runs the risk of treating no more than symptoms. If students object to grades, get rid of them; start seminars, evaluate teaching, form consortia with industry and public agencies when government publications declare that there is money for such efforts. Of course, many prestigious efforts were begun simply with recognition of an opportunity in the form of a gap in service or coverage. The words used to describe this process vary from the pejorative to the admiring, from opportunism to aggressive alertness. None is necessarily bad, but reactive planning appears thus far to have dominated the effort at most institutions to deal with current problems.

Despite these observations, statements of goals and clearly discernible attitudes about purposes already exist at any major institution in a profusion of differing priorities which more often than not appear in conflict with each other. Some of those priorities will receive attention despite lack of full consensus. Affirmative Action is such a concern, moving ahead without the consensus needed for most other major developments because of the strength of conscience, of government regulation and the threat of funding withdrawals, of enrollment pressures and a host of other considerations. Not so clearly moving, the multiplicity of other sets of goals represent one way to describe the pluralistic populations of the average large campus. So we hear that the primary mission of the university is the discovery of truth, its dissemination close behind. Others among us urge the university to become society's major change agent in redressing history's ills; still others say less but spend their time on the development of technique in media, computers, experimental learning and similar matters; some will even say that an important

function of the university is the development of applications to move the findings of basic science closer to the means of producing the goods and services needed by our highly complicated if not always sophisticated society. Lately, Nevitt Sanford and others have urged as paramount the need for student development in dealing with the whole person rather than just that part of his brain which can be made to function like a computer.

With such pluralism (and indeed many of its facets have not been mentioned here) the thought that consensus is even possible may seem naive. Surely its achievement would be formidable in the best of circumstances. Moreover, conflicting goals to which various sections of the population are determined to stick, whatever the cost, give rise to an almost concrete conservatism, where the real agenda in campus discussions may be mutual agreement to leave each other alone. But other things are also heard: it has never been done that way before, it conflicts with the facts of my discipline, and so on. Any effort to devise strategies for change must recognize not only the existence of such factors as these, but also their eminent reasonableness.

Perhaps also reasonable, but not therefore the easier to treat, is a degree of mistrust regarding motive when any among the disparate groups making up the university's plurality seeks to provide goals for all. The administration may be thought to be laying the groundwork either for an invasion of academic freedom or a move to sweep the tenureless off the campus; the faculty may be thought to be arrogating still more power unto themselves; students may be seen to be eroding standards; all on salary may be perceived as building empires. The problem, as is so often said among us, is less one of fact than of perception, but problem it remains.

Iterative Planning

Taking as our constraints these concerns regarding resources, advocacy, purposing, consensus and mistrust we may still be able to build a strategy for change by a modification of the Delphi technique of the Rand Corporation, viz., the strategy of Iterative Planning.* This concept relies upon a loop set up between the highest adminis-

*This concept of planning through wide discussion of successive drafts is currently in use by the University of California system. What is said about its implementation and implications here is solely my own idea and responsibility. A discussion of potentially related technicques, in recipe fashion, can be found in **The Management of Change**, edited by Michael Brick and Andrew A. Bushko (Community College Center, Teachers College, Columbia University, 1973).

trative offices, to the various committees of the faculty organization, to staff and student groups. Since the administration is the agency responsible for accomplishing change, it will likely take the initiative in setting up its approach to planning as a series of documents, each written with wide consultation and circulated around the loop. In fact, these documents can be either specific plans for change or attempts to arrive at consensus of purposes, but in either case the understanding is that anyone at any station around the loop is invited to comment, to revise or edit the original document or to add or substitute his own plan. Such changes then continue around the loop with full discussion of alternatives until the campus administration must draw off a statement of current planning with which to meet external deadlines. Such conflicts as may exist at that time will have to be reconciled in this statement, but this reconciliation should not automatically close discussion on the issues at conflict. Indeed, it must, of course, be remembered that a plan may be required to tolerate diverse, even conflicting goals among the various constituencies it is required to serve. Iterative planning assumes that the process will continue indefinitely in updating previous plans.

A point requiring stress is that the administration must be able to make final decisions about resource allocations with which to implement the plans developed in this fashion. The award of such funding in itself may tend to close off further discussion of controversial matters, in which case deprived protagonists will have lost. But the iterative nature of the planning loop will ensure that such protagonists will have their day in court. It will also ensure that administrative decisions for selecting among options will be set forth and, hopefully, understood.

It appears necessary to consider certain other aspects of planning if such an iterative planning cycle is to be most effective. First, all participants must not only understand the sequences of the loop itself, but probably also should consider some technical aspects of planning. Goals must relate to agencies and functions designed to meet them. Moreover, agencies and functions must relate only to stated goals, in order to avoid a lion's share of resources and attention going into tacit or unstated goals, the most frequent of which is merely that of keeping the agency alive and functioning.

Of course, a major purpose of such a planning mode is precisely to deal with the problem of hidden agendas. Institutional goals can be explicitly stated, whether they are those of Whitehead or some

other line of thought. So stated they can receive comment by all who agree, disagree or wish to change the statement. Failure of such comment can be taken as indicating agreement, and should so be understood by all the persons along the loop. Statements likely to engender the most comment within an explicit statement of goals will be references to the matters about which other publics on the campus are suspicious. Threatening encroachment by the administration must be addressed by explicit statements regarding the methods, degree and potential displacement of any reallocation schemes. And everywhere along the line statements of proposed changes must with equal candor set forth the objectives of such change. Without such objectives the possibility of later agreement about the value of the change would appear to be impossible.

A second aspect of planning which must enter such a scheme as iterative planning is the holistic nature of effective change. The dynamic system and its permanent characteristic of change has some bearing here, but so also do the highly intricate interrelations of the various parts of the system. Much like a tight fishnet all of which moves any time one knot is disturbed, so also is the campus, on which changes in program or procedure on the academic side impact the area of student services and counseling almost before they do other academic areas. In short, changes which do not accomplish corresponding changes in other entities are not likely to persevere. Proof of this point arises from the tide of criticism from all parts of the campus any time a major change of procedure or content is proposed. Consequently, the planning loop discussed above requires the widest possible distribution.

Another aspect of planning is the fact that the university campus is a vast complex of systems which interrelate to form something which usually is described as a single system but which only rarely operates in that fashion. So we speak of management information systems with full recognition that the university is also a set of systems for undertaking and reporting research, for meeting students in classrooms and imparting information therein in one fashion or other, many of which relate to still other subsystems such as multimedia efforts. Service systems also abound, from sweeping floors to delivering exotic chemicals to carting away dangerous wastes. Libraries, foreign programs, student affairs, retirement, staff training, Affirmative Action, financial aid, parking and entertainment are other systems. All must be integrated in one fashion or another in any thorough planning process. Each must play a role which management

understands in relation to all others as a system of systems with which, hopefully, a management information system can deal. Further discussion of the role of such a system and the necessity for distinguishing, with it, the differences between reporting and decision-making would lead us away from the topic of this chapter.

Additional copies of this publication and of available back issues may be obtained for $1.00 by writing to:

Editor, **Educational Comment**
College of Education
The University of Toledo
2801 W. Bancroft Street
Toledo, Ohio 43606

Previous issues have been entitled:

1960 — **Toward More Effective Learning for Children in a Space Age**

1961 — **Toward the Greater Total Fitness of American Youth and Adults**

1962 — **Redirection of Public Education**

1963 — **Toward the Development of Creativity in Early Childhood**

1964 — **Science Education 1963-2000**

1965 — **Mathematics Education, K-8; Considerations in Learning Theory, A Second Look**

1966 — **Individualized Reading**

1967 — **On Student Teaching**

*1968 — **Ideal Designs For English Programs**

1969 — **Contexts For Teacher Education**

*1970 — **A Search for Valid Content for Curriculum Courses**

*1971 — **The Ohio Model and the Multi-Unit School**

*1972 — **Field-Based Teacher Education: Emerging Relationships**

*1973 — **Teacher Education for an Urban Setting**

---

*An asterisk indicates that back copies are available.